5.1.3 Sampling Liquid Waste

a. Assemble the appropriate equipment and materials required for liquid waste sampling. The types of supplies and equipment used during liquid sampling operations may include, but are not limited to the following:

- Chain of Custody.
- Hazard assessment.
- Sampling logbook.
- De-ionized (DI) water.
- Hand tool assortment.
- Disposable tissues (e.g., Kimwipe®).
- Sampling container marking implements.
- Photo tray.
- Appropriate sample container (e.g., amber glass, polyethylene, 40-mL Volatile Organic Analysis [VOA]).
- Appropriate sampling device (e.g., Coliwasa [composite liquid waste sampler], pipet, bailer, drum thief, etc.).
- Trash/peristaltic pump with hoses, if applicable.
- Calibrated radiological survey instruments, if applicable.
- Blue ice and cooler.
- Preservation media (e.g., concentrated nitric acid, concentrated sulfuric acid, 1N sodium hydroxide solution).

b. Determine the following:

- Requested analyses.
- Appropriate sampling device.
- Appropriate sample container type.
- Minimum quantity or size of material to collect.
- Applicable preservation media (e.g., acid, base, etc.).
- Maximum sample holding time (see Table WP-5).

- Sampling location(s).

c. Prepare sample containers according to Table WP-3. Samples from waste streams designated for other disposal methods (e.g., incineration or landfill) will be placed on ice and maintained at 4° C.

Table WP-3. Analytical Methods Preservative and Container Types (for liquid samples)

Analysis Type	Preservation Media[(a)]	Bottle Type	Preservation Volume (mL)
metals, GAB	concentrated nitric acid	125 mL 250 mL 500 mL	0.50 1.0 2.0
parts per million (ppm) oil	concentrated sulfuric acid	950 mL amber glass	4.0
cyanide	1N sodium hydroxide	500 mL amber glass polyethylene	2.0

a Employ a color-based taping system for purposes of identifying the type of preservation medium used (e.g., red tape for nitric, yellow tape for sulfuric, and white tape for sodium hydroxide).

GAB = gross alpha beta.

If the analysis type is not listed on Table WP-3, preserve samples by placing them on ice and maintaining them at 4° C.

d. Perform the following when sampling liquid waste that is known to be or is potentially radioactive:

- Determine staging area and work space layout.
- Perform background radiation measurements.
- Tape plastic to the floor of the containment area, if required by the hazard assessment and control (HAC).
- Don PPE, referring to the HAC, if applicable.
- Survey the container's exterior at contact with calibrated radiation-detection instrumentation.
- Record the reading in counts per minute (cpm) in the Sampling Logbook.

- If at anytime during the operation meter readings are different than expected or greater than 30,000 cpm with an E-120, stop work, contact the ES&H Technician, and Sampling Team Lead for guidance and additional controls before proceeding.

- Upon opening, survey the container's opening for radioactivity.

e. Perform the following when sampling is complete:

- Collect and dispose of used disposable PPE (e.g., Tyvek, coveralls, gloves, booties, disposable sampling equipment) in the appropriate waste collection containers.

- Perform contamination survey of area, waste container, and sample container(s) including gross wiping and/or direct surveying with appropriate hand-held portable survey instrument(s).

- Assure that the lid to the waste container has been closed and resealed.

- Perform a whole body survey

- Contact an Environment, Safety and Health (ES&H) Technician and the Sampling Team Lead if contamination above background is detected during the whole body survey.

- Initial and date the sample bottle(s). Mark each bottle with a unique identification code. Write the requested analysis on each sample bottle.

- Initiate the Chain of Custody form. Control custody of the sample(s) in accordance with applicable chain-of-custody procedures.

- Update the Sampling Logbook accordingly.

- Include laboratory quality assurance (QA) samples, e.g., replicates, blanks, spikes as needed.

5.2 Sampling Equipment Decontamination Methods

Except where otherwise specified (in a task-specific Health and Safety Plan), decontamination shall be performed in the same level of PPE used during sampling activities.

Equipment and supplies used for equipment decontamination may include (but are not limited to) the following:

- DI, distilled or (otherwise) analyte-free water.
- Soap and/or detergent solutions.

- Trisodium phosphate (TSP).
- Isopropyl alcohol (Isopropanol, IsOH).
- Nitric acid (dilute HNO_3).
- Cleaning brushes.
- Chemical-free cloths or paper towels.
- Plastic buckets, galvanized steel pans.
- Steam cleaner.

There are four basic techniques employed (at LLNL) for removing contaminants from sampling equipment:

1. Rinsing thoroughly with analyte-free water (used for cleaning small items, lightly contaminated with polar compounds).
2. Hand washing with a suitable detergent, e.g., "Alconox" (used when contaminant types are known or suspected, particularly when organic constituents are present).
3. Systematically applying the following cleaning agents (used primarily when sampling concentrated chemical waste):

    a. Clean equipment with tap water and a TSP/water solution using a brush over a tub to remove particulate matter.

    b. Rinse with distilled water.

    c. Rinse with a 5 percent nitric acid solution.

    d. Rinse with distilled water.

    e. Rinse with pesticide-grade isopropanol.

    f. Rinse with distilled water and collect rinsate in a sample collection container for equipment blank analyses.

    g. Allow equipment to air dry.

    h. Collect decontamination liquids and properly dispose of as waste.

4. Steam cleaning (performed when equipment is too large to wash by hand).

In all cases, rinsate from decontamination activities is collected, analyzed, and compliantly dispositioned.

5.3 Analytical Methods

Concrete and soil samples will be analyzed for volatile organics and metal content according to Table WP-4:

Table WP-4. Analytical Methods for Solid Samples

Parameter/Constituent	Method[a]	EPA Hazardous Waste Numbers[b]	California Waste Code[b]
Hazardous metals preparation[c]	California Waste Extraction Test (WET), 1310	N/A	N/A
Volatile organic compounds preparation[c]	1310	N/A	N/A
Volatile organic compounds sampling	5035	N/A	N/A
Asbestos	OSHA ID-191 or NIOSH 9002	N/A	151
Antimony	6010 or 7040	N/A	181
Arsenic	7060 or 7061	D004	181
Barium	6010 or 7080	D005	181
Beryllium	6010 or 7090	N/A	181
Cadmium	6010 or 7130	D006	181
Chromium (total)	6010 or 7190	D007	181
Chromium VI	7196	D007	181
Copper	6010 or 7210	N/A	181
Total Cyanide	9010	N/A	181
Lead	6010 or 7420	D008	181
Mercury	7470 or 7471	D009	181
Nickel	6010 or 7520	N/A	181
Selenium	7740 or 7741	D010	181
Silver	6010 or 7760	D011	181
Thallium	6010 or 7840	N/A	181
Vanadium	6010 or 7910	N/A	181
Zinc	6010 or 7950	N/A	181
Acetone	8260	D001	212
Volatile halogenated organics [d]	8010, 8240 or 8260	D019, D035, D039, D040	352
Volatile aromatics[e]	8020 or 8260	D018,	352

Table WP-4 (continued)

Parameter/Constituent	Method[a]	EPA Hazardous Waste Numbers[b]	California Waste Code[b]
Semi volatiles[f]	8270	N/A	352
Pesticides[g]	8081	N/A	N/A
PCBs	8082	TSCA	261
pH[h]	9095	N/A	352
Gross alpha	9310	N/A	N/A
Gross beta	9310	N/A	N/A
Tritium	ASTM D-2476	N/A	N/A
Oil and grease	9070	N/A	352
TCLP	SW846	N/A	N/A
TTLC	Title 22 CCR § 66700	N/A	N/A

[a] Refers to EPA, 1983, unless otherwise noted.

[b] Parameters based on 22 California Code of Regulations (CCR), Section 66700. Codes applicable to solids, liquids with higher values may qualify for restricted California codes. If soil contamination is found in the soil, then cleanup California DTSC codes will be applied (611).

[c] Parameters based on 22 CCR 66700, Zero Headspace Extraction (ZHE).

[d] Includes carbon tetrachloride, chloromethane, ethylene dichloride, methyl ethyl ketone, methylene chloride, tetrachloroethylene, trichloroethane, trichloroethene, trichlorofluoromethane, and trichloromethane.

[e] Includes benzene, hexachlorophenol, toluene, and xylene.

[f] Includes dichlorophenoxyacetic acid, and pentachlorophenol.

[g] Includes endrin and heptachlor.

[h] If pH is less than or equal to 2, an anion test will be performed to test for acetic acid hydrochloric acid, nitric acid, phosphoric acid, sulfuric acid. If the pH is greater than or equal to 12, the material will be characterized as containing Sodium hydroxide based on generator knowledge.

ASTM = American Society for Testing and Materials.

CCR = California Code of Regulations.

N/A = Not applicable.

Table WP-5. Sample Containers, Preservatives, and Holding Times

Type of analysis	EPA analytical method[a]	Minimum no. of samples and size[b]	Sample container type[b]	Typical preservation[b] solid and liquid Waste	Typical preservation[b] wastewater	Maximum holding time
Inorganic tests						
Cyanide—total and amenable to chlorination	Method 9010, 9011, or 9012	1 × 100 mL (liquid) 1 × 100 g (solid)	P, G (liquid, solid)	Cool to 4°C	For total cyanide: cool to 4°C , add NaOH to pH>12, and store in the dark. For cyanide amenable to chlorination: cool to 4°C, add NaOH to pH>12, add 0.6 g ascorbic acid, and store in the dark (liquid, solid).	14 days
Metals (total)	Method 6010 or 7000 series	1 × 250 mL (liquid) 1 × 50 gm (solid)	P, G (liquid, solid)	Cool to 4°C	For total metals: add HNO_3 to pH<2. For dissolved metals: filter on-site, add HNO_3 to pH<2. Cool to 4°C (liquid). Cool to 4°C (solid).	6 months
TCLP[c]	Method 1311[d]	1 × 250 gm (solid)	P, G (solid)	Cool to 4°C	Cool to 4°C (solid).	7 days[e]
WET[f]	WET	1 × 250 gm (solid)	P, G (solid)	Cool to 4°C	Cool to 4°C (solid).	7 days[e]
Organic tests						
Phenols	Method 8270	1 × 500 mL (liquid) 2 × 40 mL VOA (solid)	AG-TLC (liquid) G-TLC (solid)	Cool to 4°C	Add 0.008% $Na_2S_2O_3$. Cool to 4°C (liquid). Cool to 4°C (solid).	7 days[e]
Oil and grease	Method 9070	1 × 500 mL (liquid)	G (liquid)	Cool to 4°C	Add H_2SO_4 to pH<2. Cool to 4°C (liquid).	28 days

Table WP-5. (continued)

Type of analysis	EPA analytical method[a]	Minimum no. of samples and size[b]	Sample container type[b]	Typical preservation[b] solid and liquid Waste	Typical preservation[b] wastewater	Maximum holding time
Organic tests (continued)						
Volatile organics	Method 8240 Method 8260 Method 8010 Method 8020 Method 8021	2 × 40 mL zero head-space (liquid) 1 × 4 oz squat jar, zero head-space, Teflon tape (solid)	G-TLS (liquid) G-TLC (solid)	Cool to 4°C	Cool to 4°C immediately; add 100 mg $Na_2S_2O_3$/L if residual chloride is present (liquid). Cool to 4°C (solid).	14 days
Semivolatile organics	Method 8270	1 × 1 L (liquid) 2 × 40 mL VOA (solid)	AG-TLC (liquid) G-TLC (solid)	Cool to 4°C	Cool to 4°C immediately; add 100 mg $Na_2S_2O_3$/L if residual chloride is present; adjust to pH<2 with H_2SO_4, HCL, or $NaHSO_4$ (liquid). Cool to 4°C (solid).	7 days
Pesticides/ PCBs	Method 8080	1 × 1 L (liquid) 1 × 4 oz squat jar, zero headspace, Teflon tape (solid)	AG-TLC (liquid) G-TLC (solid)	Cool to 4°C	Cool to 4°C (liquid, solid).	7 days
Total petroleum hydro-carbons	Method 8010/ 8015	2 × 40 mL, zero headspace (liquid) 1 × 4 oz squat jar, zero headspace, Teflon tape (solid)	G-TLC (liquid, solid)	Cool to 4°C	Cool to 4°C (liquid, solid).	7 days

Table WP-5. (continued)

Type of analysis	EPA analytical method[a]	Minimum no. of samples and size[b]	Sample container type[b]	Typical preservation[b] solid and liquid Waste	Typical preservation[b] wastewater	Maximum holding time
Physical tests						
Gross alpha, gross beta	Method 9310	1 × 250 mL (liquid) 1 × 10 gm (solid)	P (liquid, solid)	Cool to 4°C	pH < 2 with nitric acid (liquid).	6 months
Tritium	Method 906.0	1 × 250 mL (liquid) 1 × 10 gm (solid)	P (liquid, solid)	Cool to 4°C	pH < 2 with nitric acid (liquid).	6 months
Gamma	Method 901.1	1 × 250 mL (liquid) 1 × 10 gm (solid)	P (liquid, solid)	Cool to 4°C	pH < 2 with nitric acid (liquid).	6 months

a EPA, 1986.

b Sample container type, volume, and preservative will be verified with the analytical laboratory before sampling.

c Waste streams subject to Land Disposal Restrictions.

d Extraction procedure. The extracted waste is then analyzed using EPA Methods 6010 or 7000, and 8000 Series (EPA, 1986).

e Days to extraction; 40 days to analysis after extraction.

f Waste streams whose concentrations fall between the soluble threshold limit concentration (STLC) and total threshold limit concentration (TTLC).

g EPA, 1983.

h American Public Health Association et al., 1989, p. 2–86.

j EPA, 1980.

AG-TLC = Amber glass with Teflon-lined cap.

G = Glass.

G-TLC = Glass with Teflon-lined cap.

G-TLS= Glass with Teflon-lined septum.

N/A = Not applicable. Method does not specify preservative or holding time.

P = Polyethylene.

PCB = Polychlorinated biphenyl.

TCLP = Toxicity characteristic leaching procedure.

VOA = Volatile organic analysis.

WET = Waste extraction test.

6.0 CLEAN-CLOSE STANDARDS

LLNL has compiled data showing (onsite) background levels for metal constituents in concrete, and metal in soil. Samples were obtained from various onsite locations not

known to be anthropogenically contaminated. These constituent levels will be used to determine clean closure for concrete and metals. Alternate methods for determining clean-close standards are as follows:

- Fate and transport modeling
- Risk-assessment modeling (employed to derive clean-close standards for volatile organic chemicals (VOCs).
- Removing all residues pursuant to 22 California Code of Regulations (CCR) 66265.114.

Table WP-6. Clean-Close Standards for Metal Constituents in Concrete[a]

Total Metals Concentrations in Uncontaminated Concrete				
Metal	**Mean concentration, mg/kg**	**One Standard Deviation**	**Mean + one standard deviation, mg/kg**	**Number of Analyses**
Antimony	8.56	14.47	23.03	38
Arsenic	3.68	6.22	9.91	38
Barium	281.79	136.41	418.20	36
Beryllium	8.17	10.95	19.11	38
Cadmium	2.65	6.08	8.73	38
Chromium	42.10	10.14	52.24	38
Cobalt	7.97	5.74	13.71	38
Copper	38.34	8.94	47.27	38
Lead	14.55	17.11	31.66	38
Manganese	380.60	141.04	521.64	38
Mercury	1.70	7.41	9.11	38
Molybdenum	5.20	12.86	18.05	38
Nickel	41.62	11.15	52.77	38
Potassium	1485.98	475.75	1961.73	38
Selenium	43.58	22.00	65.58	38
Silver	1.88	6.27	8.15	38
Strontium	122.92	33.28	156.20	38
Thallium	All ND	N/A	N/A	37
Vanadium	38.43	11.49	49.92	38
Zinc	87.47	95.09	182.56	37

a Concrete samples taken from Buildings 177, 222 and 227

Table WP-7. Clean-Close Standards for Metal Constituents in Soil

Metal	Total Screening Value (mg/kg)	STLC Screening Value (mg/L)
Antimony	1.12	0.15
Arsenic	8.51	0.237
Barium	308	16.7
Beryllium	0.62	0.038
Cadmium	1.59	0.009
Chromium	72.4	0.727
Cobalt	14.6	0.985
Copper	62.5	2.6
Lead	43.7	0.987
Mercury	0.14	0.0063
Molybdenum	2.5	0.013
Nickel	82.8	1.68
Selenium	0.4	0.13
Silver	2.5	0.015
Thallium	0.5	0.26
Vanadium	65.2	1.22
Zinc	75.3	4.52

Table WP-7 shows the maximum (on-site) background concentration levels for metal constituents found in soil. The levels reflected on the table were determined from reviewing the total threshold limit concentration (TTLC) and soluble threshold limit concentration (STLC) results of 120 soil samples. The soil extractions were collected at depths ranging from 0 to 12 feet, in areas deemed uncontaminated. The 120 samples were taken during site investigations or while performing pre-construction site-characterization activities.

Release levels for radioactivity and clean close levels for volatile organic compounds (VOCs) are provided in the revised Closure Plan.

8.0 REFERENCES

American Public Health Association, American Water Works Association, and Water Environment Federation (1993), *Standard Methods for the Examination of Water and Wastewater*, 18th Edition, American Public Health Association, Washington, D.C.

California Code of Regulations (CCR), Title 22, Section 66700, Zero Headspace Extraction (22 CCR 66700).

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U.S. Department of Energy (DOE) O 440.1A, "*Worker Protection Management for DOE Federal and Contractor Employees.*"

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Lawrence Livermore National Laboratory (LLNL). (1998). *Part A Permit Application for Hazardous Waste Treatment and Storage Facilities, Livermore Site.* Lawrence Livermore National Laboratory, Livermore, CA (UCAR-1027-98).

Lawrence Livermore National Laboratory. (2003). *LLNL Environmental, Safety, and Health Manual.* Lawrence Livermore National Laboratory, Livermore, CA (UCRL-AR-119618).

Public Law 91-596 (5)(a)(1), Occupational Safety and Health Administration (OSHA).

7.0 ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygientists
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
B233	Building 233
CAS	Concrete, asphalt and soil
CEQA	California Environmental Quality Act
CCR	California Code of Regulations
CFR	Code of Federal Regulations

Coliwasa	Composite liquid waste sampler
CSU	Container Storage Unit
CP	Closure Plan
DHS	(California) Department of Health Services
DI	De-ionized
DOE	U.S. Department of Energy
DTSC	California Department of Toxic Substances
EPA	U.S. Environmental Protection Agency
ES&H	Environment, Safety & Health
FID	Flame Ionization Detector
GAB	Gross Alpha Beta
HAC	Hazard Assessment and Control
HASP	Health and Safety Plan
HNO_3	Nitric acid
IsOH	Isopropyl alcohol
LDRs	Land disposal restrictions
LLNL	Lawrence Livermore National Laboratory
N/A	Not applicable
OSHA	Occupational Safety and Health Administration
P	Polyethylene
PCB	Polychlorinated biphenyl
PID	Photo ionization detector
PPE	Personal protective equipment
ppm	Part(s) per million

QA	Quality assurance
RHWM	Radioactive and Hazardous Waste Management Division
STLC	Soluble threshold limit concentration
TCLP	Toxicity characteristic leaching procedure
TSDF	Treatment, storage, and disposal
TSP	Trisodium phosphate
TTLC	Total threshold limit concentration
U.S.	United States
VOA	Volatile organic analysis
WAC	Waste Acceptance Criteria
WET	Waste Extraction Test
ZHE	Zero headspace extraction

Appendix A.

Health And Safety Plan (HASP) For Closure Of Building 233 Container Storage Unit

(for Phase I activities associated with closure of the Building 233 Container Storage Unit)

HEALTH AND SAFETY PLAN (HASP) FOR CLOSURE OF BUILDING 233 CONTAINER STORAGE UNIT

1.0 SCOPE

The B233 CSU is a structural-steel-framed building with a metal roof and metal walls of the chain-link-mesh variety. The unit contains two cells (which are kept locked when unattended), each spanning an area of approximately 15 feet by 40 feet. These cells were used to store containers of solid (form) radioactive waste. No spills have been noted as having occurred in this unit over the course of its history. No hazardous or radioactive waste is currently being stored in the B233 CSU cells. Maximum contamination levels, if detected, are anticipated to be in the "trace-quantity" realm; employee exposure to significant levels of radioactive or hazardous constituents is, therefore, not anticipated. The B233 CSU closure will be accomplished in two phases:

- Phase I consisting of site characterization activities.
- Phase II addressing required remedial actions, as necessitated by Phase I analytical yields.

Personnel meeting the training requirements specified in Section 8 of the B233 CSU Closure Plan will perform the work. Further, an independent, California-registered, professional engineer will oversee the project. This Health and Safety Plan (HASP) identifies the basic hazards that could be encountered by technical personnel performing duties associated with the B233 CSU closure. Additionally, this document prescribes the control measures to be employed (by all participants) to prevent and avert personnel injury, environmental degradation, and property damage. The tasks associated with Phase I may include, but are not limited to the following:

- Pressure washing.
- (Other) preliminary decontamination methods.
- Waste container handling.
- Working from elevations.
- Sample collection (which may include area-swiping, coring, drilling and the use of radiation-detection instrumentation).
- Emergency management.

The Phase II job specifics will be defined subsequent to the site characterization phase (as mentioned above). Phase II operations may include concrete, asphalt, and soil (CAS) removal operations. A separate hazard assessment, addressing operational specifics, will be conducted prior to the commencement of Phase II work.

1.1 Pressure Washing Activities

Prior to extracting samples, the two 15 feet x 40 feet storage cells will be steam-cleaned and pressure-washed. This cleaning measure will be accomplished working down gradient (from east to west). The rinsate generated as a result of this step will be collected, analyzed and disposed of in accordance with applicable federal, state, and local regulations. Technicians[1] assigned to pressure washing duties will be donned in level D personal protective equipment (PPE). This PPE will include, at a minimum:

Eye Protection	Safety Glasses (with side shields) and Splash Shield
Hand Protection	Medium-to heavyweight latex, nitrile, neoprene, PVC (or equivalent moisture-resistant gloves) / taped at the wrists
Full-body Protection	Disposable poly-coated tyvek coveralls, raingear, or equivalent moisture-resistant suit)
Foot Protection	Steel-toed boots (composed of PVC, neoprene or equivalent moisture-resistant material) / taped at ankles.

Personnel operating the pressure-washing unit[2] will be trained in its safe operation. All workers involved with this cleaning activity will take the necessary safety precautions to guard against hydro-injection, thermal burns, and slip, trip and fall injuries.

2.0 PRELIMINARY DECONTAMINATION METHODOLOGIES

Additional Phase I decontamination activities may involve such basic cleaning methodologies as wiping, mopping, and dry and wet vacuuming. Adherence to safe work practices (e.g., wearing prescribed PPE, taking cognizance of the hazards posed by applied cleaning agents, maintaining a neat work environment, utilizing "wet area" caution signs, employing good hygiene practices, following applicable standard operating procedures) will minimize the potential for work-related injuries.

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1 Subcontractors participating in closure activities will don PPE in accordance with said subcontractor's Site-specific HASP. The requirements specified in the subcontractor's HASP will be at least as stringent as those outlined in this document.

2 The noise produced by the pressure washer does not exceed the American Conference of Governmental Industrial Hygienist (ACGIH) action level of 85 decibels; hearing protection is, therefore, not required.

3.0 WASTE CONTAINER HANDLING

Heavy containers, holding accumulated rinsate, soil, and drilling mud, may be generated during the initial phase of the B233 CSU closure process. Forklifts and drum dollies are the primary pieces of equipment used to handle heavy containers. Care shall be taken by all participants to avoid back injuries, pinch points, container rupturing and equipment-recoil[3] when opening, closing, palletizing, loading, unloading or otherwise handling heavy containers of waste materials. Moreover, only employees possessing a current LLNL forklift license will be allowed to operate industrial lift trucks. Personnel performing container-handling duties will wear Level D PPE:

Eye Protection	Safety Glasses (with side shields)
Hand Protection	Leather, or cloth gloves (or other hand protection of equal durability and strength)
Full-body Protection	Lab-issued uniform or coveralls
Foot Protection	Steel-toed boots.

4.0 WORKING FROM ELEVATIONS

It is not anticipated that B233 CSU site characterization activities will involve working from elevations. However, any work performed from elevated surfaces raises a number of significant safety concerns. If work assignments require personnel to access heights in excess of 6 feet, such work will be conducted in accordance with the following:

[3] Loaded drum dollies subjected to sudden releases can snap back with violent force against the torso of the equipment handler.

Topic	*Environment, Safety & Health (ES&H) Manual* Reference	Work Smart Standard
Fall Protection	Document 11.1, "*Personal Protective Equipment,*" Section 3.12, "*Fall Protection*"	DOE Order 440.1A, "*Worker Protection Management for DOE Federal and Contractor Employees*" Public Law 91-596 (5)(a)(1), Occupational Safety and Health Administration (OSHA)
Ladders	Document 11.2, "*Hazards-General and Miscellaneous,*" Section 6.0, "*Ladders and Step Stools.*"	DOE Order 440.1A, "*Worker Protection Management for DOE Federal and Contractor Employees*" Public Law 91-596 (5)(a)(1), OSHA
Roof Access	Document 15.1, "*Roof Access.*"	29 Code of Federal Regulations (CFR) 1910 Subpart D, "*Walking/Working Surfaces*" 29 CFR 1926 Subpart X, "*Stairways and Ladders*" American National Standards Institute (ANSI), 14.1 through 14.5

In addition to complying with the requirements contained in the above listed safety documents, personnel performing work from elevated surfaces will be made cognizant as to the proximity of overhead power lines and shall maintain a safe distance from the same.

5.0 SAMPLE COLLECTION

Sampling activities could include area swipes, coring, drilling and surveying (with radiation detection devices). Prerequisite to conducting concrete penetration or soil excavation activities, however, is a permit that must be obtained from the LLNL Plant Engineering Department. Plant Engineering is responsible for ensuring that areas designated for penetration or excavation are clear of buried utilities, e.g., electrical conduits, gas, water, and air lines. Additionally, the permit-acquisition process requires that a review be conducted (by LLNL wildlife biologist and the LLNL archaeologist) that assesses the proposed activity's potential impact to sensitive ecological systems and cultural resources.

Topic	*ES&H Manual* Reference	Work Smart Standard
Coring and drilling	Document 11.2,"*Hazards-General and Miscellaneous,*" Section 18.0, "*Concrete Penetration and Soil Excavation*"	29 CFR 1926 Subpart K, "*Electrical*" 29 CFR 1926 Subpart P," *Excavation*"

6.0 EMERGENCY PROCEDURES

Radiological or hazardous chemical emergencies stemming from employee contact with or exposure to dangerous quantities of radioactive or hazardous materials are highly improbable. However, serious industrial injury can occur while performing a number of the planned operations.

LLNL implements its Contingency Plan whenever an employee sustains an injury that requires treatment beyond basic first aid. In such an instance, workers are directed to call 911 (when using a site phone) or 925-447-6880 (if calling from a cell phone) to summon emergency assistance.

In the event of an earthquake or major fire, the LLNL Self-Help Plan will be implemented. The Self-Help PLAN identifies Assembly Points, and First Aid and Sweep Team Leaders. Self-Help Plans empower satellite groups to self-administer[4] needed emergency services during site-wide occurrences whose magnitudes extend beyond the response capabilities of LLNL emergency crews.

The B233 CSU contains the following emergency supplies and equipment (see Appendix A, Figure A-2 of the B233 CSU Closure Plan):

- Emergency eyewash/shower.
- Fire extinguisher.
- Telephone.
- Spill Kit.
- Electrical Shut-off.
- PPE Locker.

[4] During major emergencies, the onsite emergency staff may be unable to respond expeditiously to each summons for assistance.

Appendix B.

Photographs of the B233 Container Storage Unit

Photo 1: Exterior view of the Building 233 Container Storage Unit

Photo 2: Building 233 Container Storage Unit North Cell

Photo 3: Building 233 Container Storage Unit South Cell

Photo 4 : Building 233 Container Storage Unit 3000 Gallon Ancillary (Run-off) Containment System

Photo 5: Building 233 Container Storage Unit "Contact-actuated" Centrifugal Pump

Appendix C.

Lawrence Livermore National Laboratory Site Map

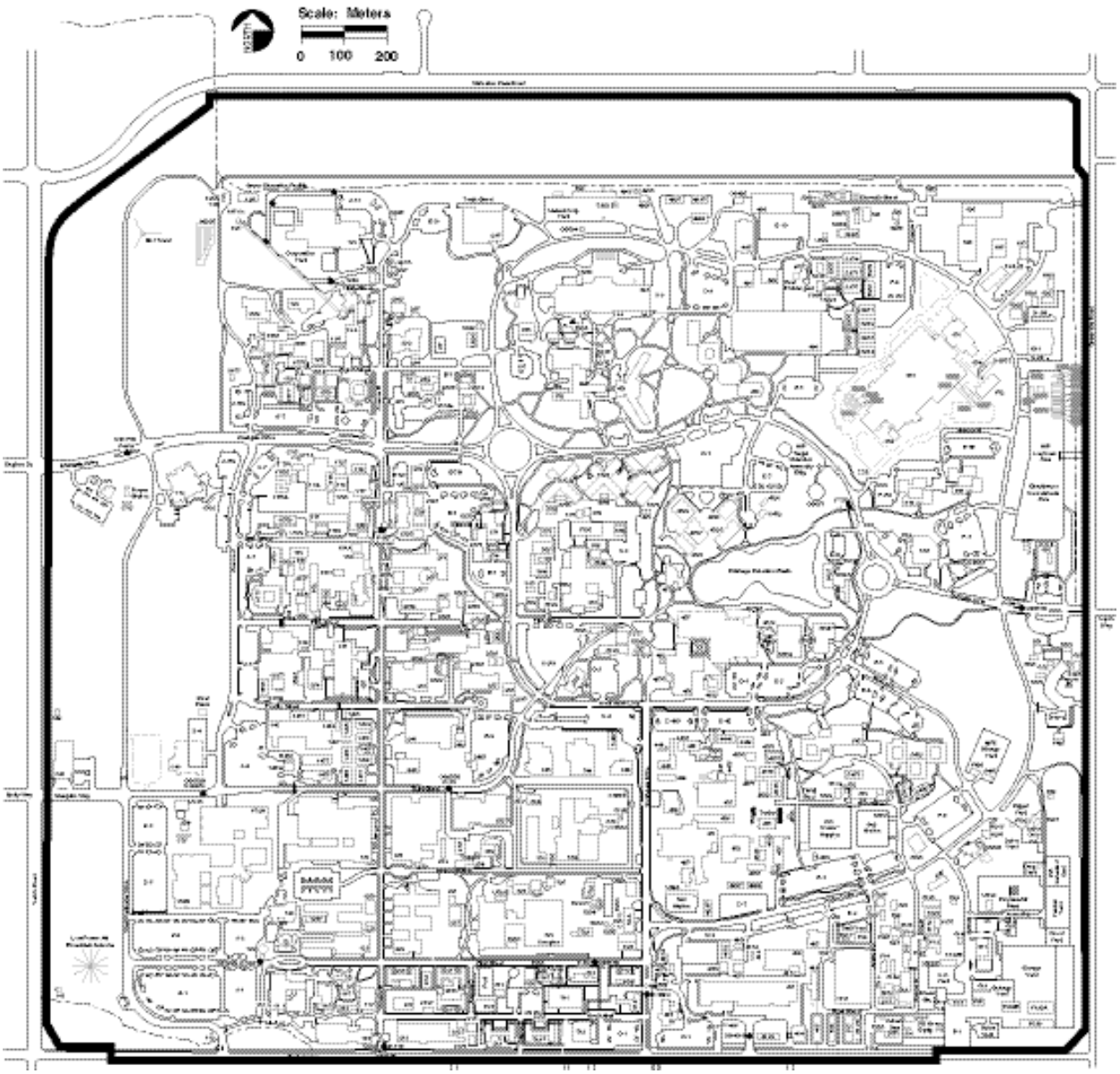
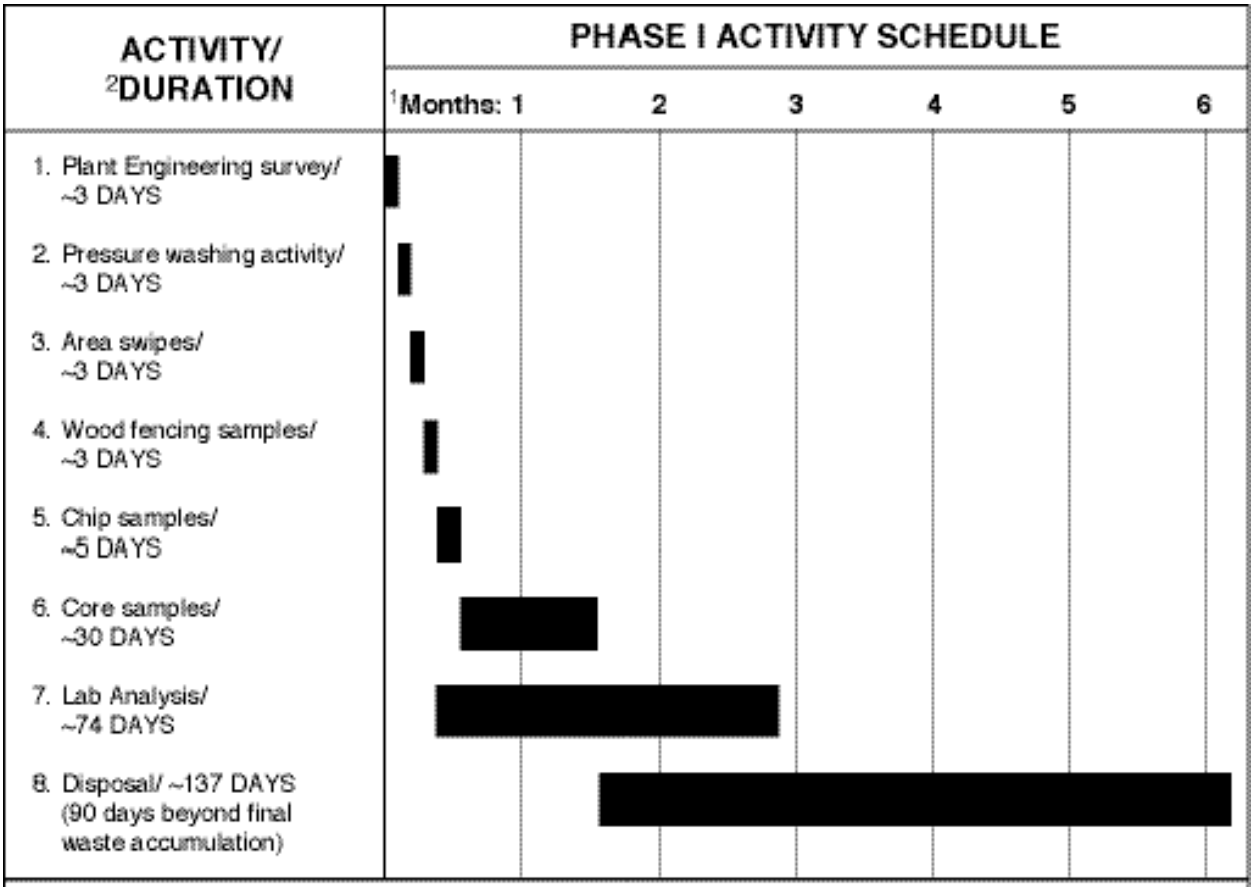


Figure C-1. Site Map of Lawrence Livermore National Laboratory Main Site

Appendix D.

Phase I Activity Schedule



[1]NOTE: Work will commence subsequent to DTSC approval.

[2]NOTE: The Building 233 Container Storage Unit is located in an LLNL high-security area. Work activities are subject to random, intermittent interruptions. These work stoppages often occur without forewarning. The estimated work durations that appear on the Phase I Activity chart takes into account the downtime that may be incurred while implementing the B233 CSU work plan.

Attachment 2.

Phase II Work Plan

Environmental Protection Department
Operations and Regulatory Affairs Division

Phase II Work Plan for the Building 233 Container Storage Unit

Lawrence Livermore National Laboratory
University of California Livermore, California 94551

Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.

PHASE II WORK PLAN FOR THE BUILDING 233 CONTAINER STORAGE UNIT

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PHASE II WORK PLAN FOR THE BUILDING 233 CONTAINER STORAGE UNIT

1.0 INTRODUCTION

Phase II of the site characterization process continued the sampling and analysis work in locations where contamination above allowable concentrations for soil and concrete and other contaminants were detected in Phase I. In accordance with the SAP and with agreement with the DTSC staff, Phase II work did not include further sampling and analysis where soil sample from 0 and 2 ft, concrete, cinder block walls, and wooden slats did not indicate hazardous constituent above Closure Plan stated clean-up levels.

Also, the results of Phase I work suggested that some of the contamination on the concrete and cinder brick wall were from layers of paint and epoxy coating applied over the years. LLNL staff took additional samples of the concrete and cinder block wall after scraping the layers. The results confirmed that the level of hazardous constituents found in Phase I was from the paint and epoxy and was not as a result of hazardous waste management operations.

Waste generated during Phase II activities was collected, sampled, and disposed of in accordance with applicable regulations.

For background, potential contaminant and historical release information see the Closure Plan and the Phase I Work Plan.

The Phase II activities began on October 17, 2005, and ended on October 25, 2005.

2.0 OBJECTIVES

The primary purpose of the B233 CSU Phase II Work Plan is to describe activities associated with further characterizing and decontaminating the storage unit for subsequent closure. The objectives of the work are as follows:

- Determine the source of the high metal values in the chip samples.
- Further characterize the soil and concrete in locations where Phase I activities showed levels of constituents of concern above the maximum allowable levels.
- Fulfill the phased closure approach as prescribed by the DTSC staff.

3.0 PHASE II ACTIVITIES

The activities were conducted by locating the utility lines, pressure washing the entire CSU cells, obtaining swipe samples, taking chip samples, and collecting soil samples by coring. The same processes and procedures for conducting activities for Phase I were followed for the Phase II activities. For details of processes and procedures see

Section 4.0 of the Phase I Work Plan (Attachment 1). The epoxy and paint coatings on the cinder block walls were removed before collecting the samples in order to not skew the sample results.

The Phase II sampling activities consisted of 4 chip samples from the cinder block walls, 2 concrete floor core samples, and 24 soil samples. For location of the samples see Figure WPII-1 and for sampling strategy see Table WPII-1.

Table WPII-1. Phase II Sampling Strategy

Sample Location	Sample Type	Sample Quantity
Cinder block walls	Chip	4 (2 per cell)
Concrete floor	Core	2 (2 @ north cell)
Soil	Core	24 (3 per cell @ 5, 10, 15 and 20 ft)

For sampling methodologies, analytical method, preservation, sample container, holding time, equipment decontamination see Section 5.0 of the Phase I Work Plan (Attachment 1).

4.0 PHASE II HEALTH AND SAFETY PLAN

The Phase I Health and Safety Plan was followed because it covers the pressure washing and sampling activities used in Phase II. For a copy of the Health and Safety Plan, see Appendix A of the Phase I Work Plan (Attachment 1).

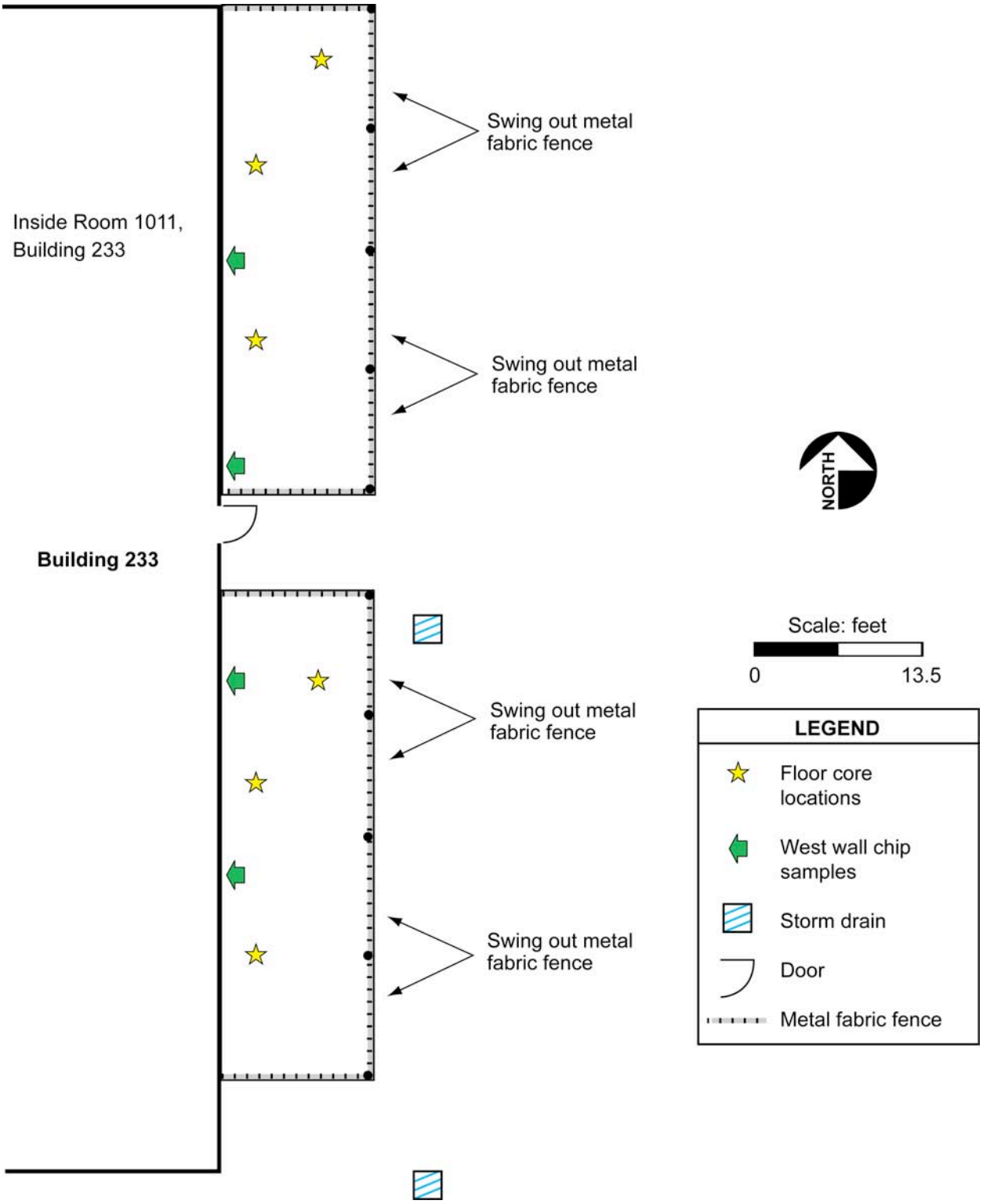

Figure WPII-1. Proposed Sample Locations in B233 CSU

Attachment 3.

Phase III Work Plan

Environmental Protection Department
Operations and Regulatory Affairs Division

Phase III Work Plan for the Building 233 Container Storage Unit

Lawrence Livermore National Laboratory
University of California Livermore, California 94551

Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.

PHASE III WORK PLAN FOR THE BUILDING 233 CONTAINER STORAGE UNIT

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PHASE III WORK PLAN FOR THE BUILDING 233 CONTAINER STORAGE UNIT

1.0 INTRODUCTION

Phase III of the site characterization process continued the decontamination, sampling and analysis work in locations where pesticides on the cinder block wall and the CSU floor were detected. In accordance with agreement with the DTSC staff, Phase III activities consisted of pressure washing and sampling for the pesticides. The Closure Plan did not contain any clean-up levels for pesticides since pesticides and pesticide-contaminated waste were not handled at the CSU and were not a part of the original list of constituents of concern.

Waste generated during Phase III activities was collected, sampled, and disposed of in accordance with applicable regulations.

The Phase III activities occurred on October 13, 2006.

2.0 OBJECTIVES

The primary purpose of the B233 CSU Phase III Work Plan is to describe activities associated with further characterizing and decontaminating the storage unit for subsequent closure. The objectives of the work are as follows:

- Pressure wash areas where pesticides were previously detected.
- Resample the effected areas.
- Fulfill the phased closure approach as prescribed by the DTSC staff.

3.0 PHASE III ACTIVITIES

The activities included pressure washing the pesticide-impacted areas of the CSU and obtaining swipe samples from the washed areas. The rinsate was also sampled for characterization and disposal purposes. The same processes and procedures for conducting activities for Phase I were followed for Phase III activities. For details of processes and procedures see Section 4.0. of the Phase I Work Plan (Attachment I).

The Phase III sampling activities consisted of four swipe samples from the cinder block walls, four concrete floor swipe samples and two rinsate samples. For location of the samples see Figure WPIII-1 and for sampling strategy see Table WPIII-1.

For sampling methodologies, analytical method, preservation, sample container, holding time, equipment decontamination see Section 5.0 of the Phase I Work Plan (Attachment 1).

Table WPIII-1. Phase III sampling strategy

Sample Location	Sample Type	Sample Quantity
Cinder block walls	Swipe	4 (2 per cell)
Concrete floor	Swipe	4 (2 per cell)
Rinsate	Bulk	2 (1 per cell)

4.0 PHASE III HEALTH AND SAFETY PLAN

The Phase I Health and Safety Plan was followed because it covers rinsing and sampling activities similar to Phase III activities. For a copy of the Health and Safety Plan, see Appendix A of the Phase I Work Plan (Attachment 1).

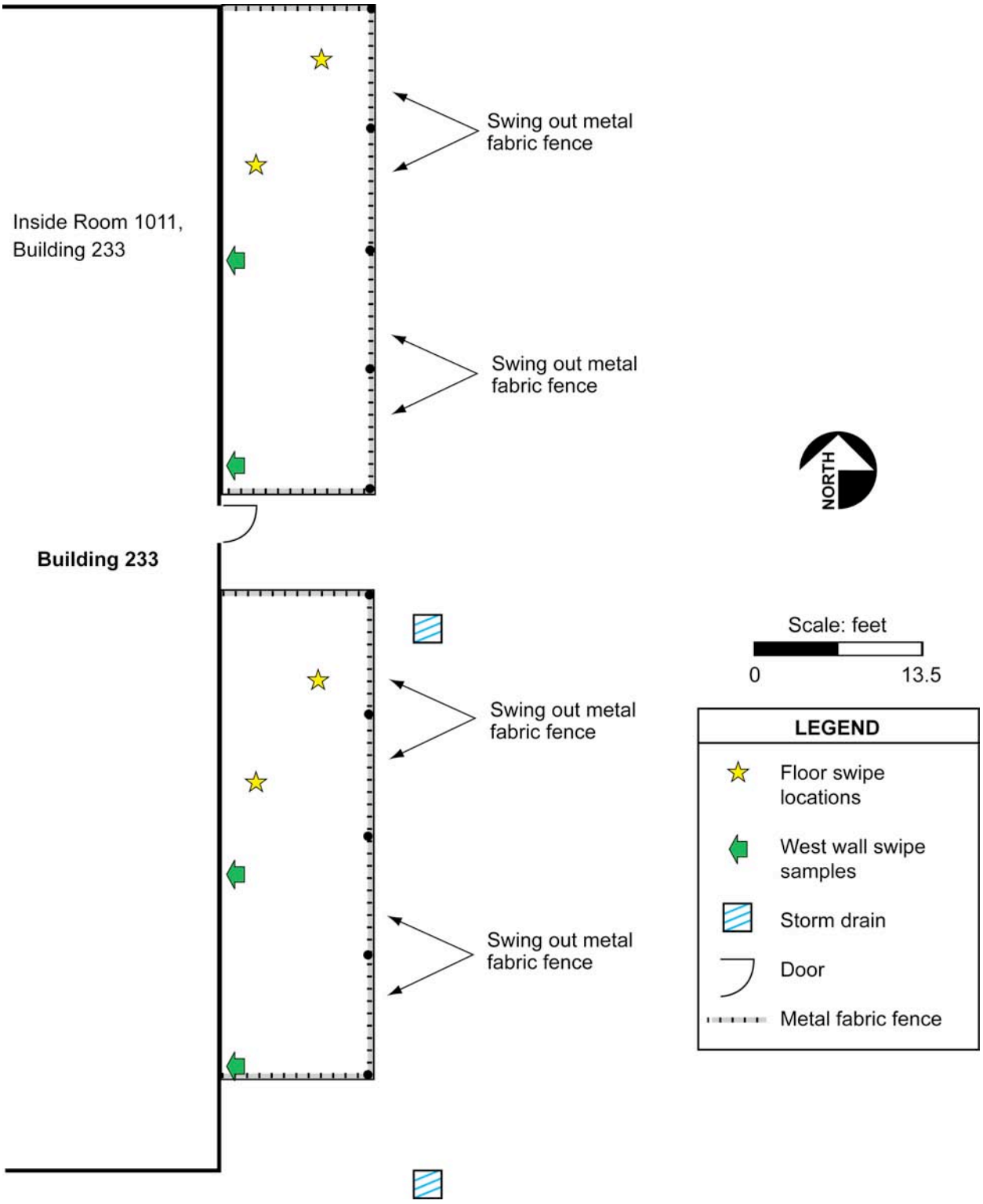


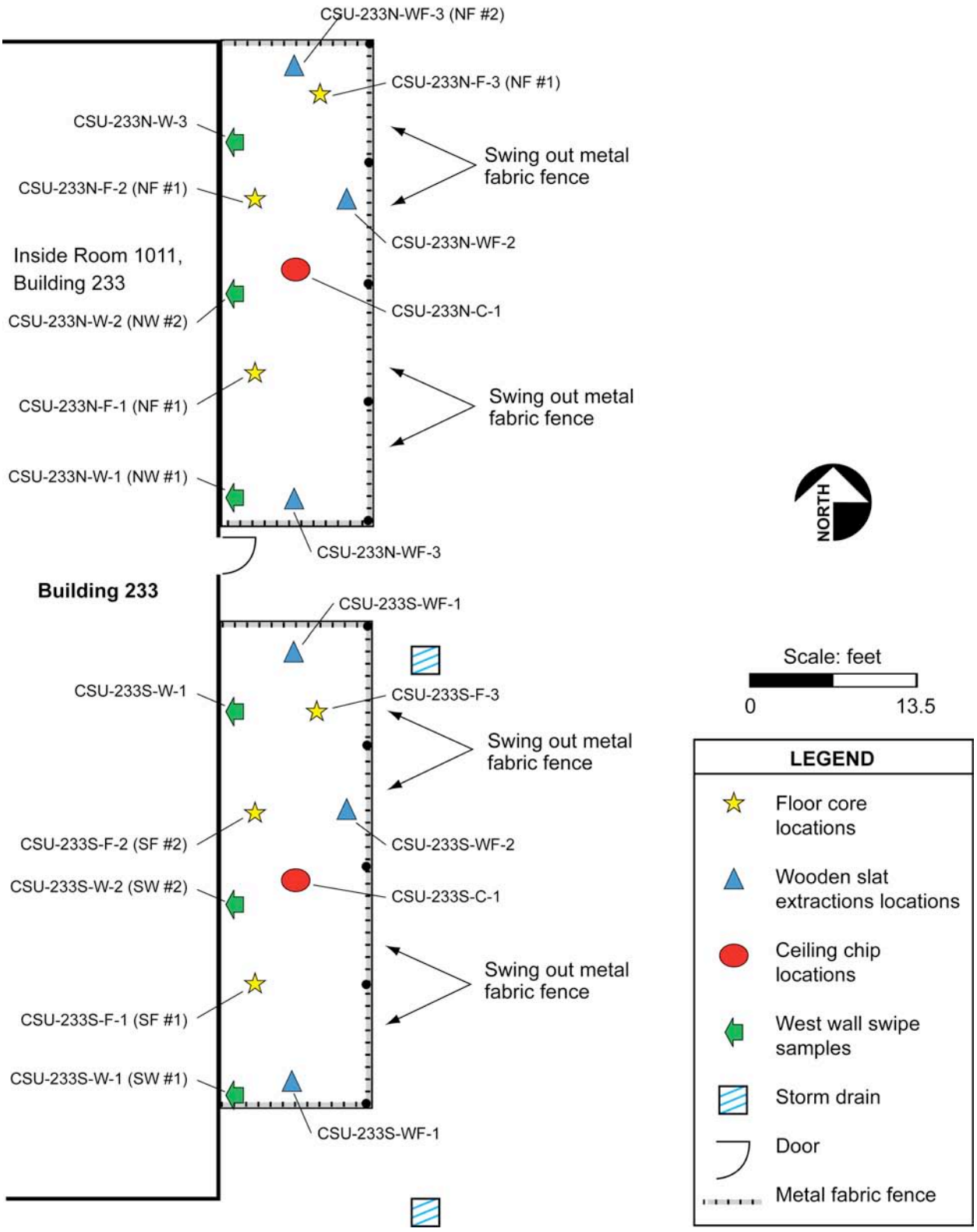
Figure WPIII-1. Proposed Sample Locations in B233 CSU

Attachment 4.

Phase I Analytical Summary

B233 Phase I Analytical Data Summary
Contents

* See figure on next page for sample locations.



Phase I Sample Locations in B233 CSU

Sample #CSU-233 Decontamination Rinsewater

Sample Matrix - Decontamination rinsewater

Radioactivity Summary	Analyte	Sample Media	Release Level (RL)	Units	Comments
		Rinsewater			
	Gross alpha	24	N/A	pCi/L	(1)
	Gross beta	33	N/A	pCi/L	(1)
	Tritium	350	N/A	pCi/L	(1)

Volatile Organic Compounds Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Rinsewater			
	Bis(2-ethylhexyl)phthalate	51	N/A	ug/L	(1)
	Chloroform	9	N/A	ug/L	(1)
	Oil and Grease	16.7	N/A	mg/L	(1)

All VOCs over the detection limit reported.

Metals Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Rinsewater			
	Arsenic	0.038	N/A	mg/L	(1)
	Barium	3.8	N/A	mg/L	(1)
	Cadmium	0.037	N/A	mg/L	(1)
	Chromium	0.21	N/A	mg/L	(1)
	Cobalt	0.037	N/A	mg/L	(1)
	Copper	0.82	N/A	mg/L	(1)
	Lead	0.67	N/A	mg/L	(1)
	Manganese	1.6	N/A	mg/L	(1)
	Mercury	0.0026	N/A	mg/L	(1)
	Molybdenum	0.052	N/A	mg/L	(1)
	Nickel	0.23	N/A	mg/L	(1)
	Potassium	18.7	N/A	mg/L	(1)
	Selenium	0.026	N/A	mg/L	(1)
	Silver	0.011	N/A	mg/L	(1)
	Strontium	0.35	N/A	mg/L	(1)
	Vanadium	0.089	N/A	mg/L	(1)
	Zinc	27.8	N/A	mg/L	(1)

All metals over the detection limit reported.

pH Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Rinsewater			
	pH	7.2	N/A	Units	(1)

(1) Decontamination rinsewater met sanitary sewer discharge limits and was authorized for release to sewer. However, waste operations personnel shipped the rinsewater for off-site disposal on 9-22-04 after bulking with similar wastewaters. One sample, instead of two, was obtained because the first sample met sanitary sewer discharge limits.

Sample #CSU-233N-C-1 (north cell, ceiling swipe location #1)

Sample Type - Swipe

	Analyte	Sample Type	LOS	Units	Comments
Radioactivity Summary		Swipe			
	Gross alpha	2.8	2.8	dpm	
	Gross beta	3.5	3.5	dpm	
	Tritium	22	22.0	dpm	

	Analyte	Sample Type	Clean Up Level	Concentration	Comments
Volatile Organic Compounds Summary		Swipe		(ng/kg)	
		(ng/swipe)			
	BHC, alpha isomer	5.1	(1)	20.4622	(2)

All VOCs over the detection limit reported.

	Analyte	Sample Type	Clean Up Level	Concentration	Comments
Metals Summary		Swipe		(mg/kg)	
		(mg/swipe)			
	Barium	0.00098	(1)	0.00393	(2)
	Cadmium	0.00013	(1)	0.00052	(2)
	Chromium	0.00270	(1)	0.01083	(2)
	Cobalt	0.00022	(1)	0.00088	(2)
	Copper	0.00120	(1)	0.00481	(2)
	Manganese	0.00110	(1)	0.00441	(2)
	Molybdenum	0.00047	(1)	0.00189	(2)
	Potassium	0.02100	(1)	0.08426	(2)
	Silver	0.00043	(1)	0.00173	(2)
	Strontium	0.00054	(1)	0.00217	(2)
	Zinc	0.01400	(1)	0.05617	(2)

All metals over the detection limit reported.

(1) All residue resulting from the handling of hazardous waste in the facility will be removed and/or decomtaminated (if possible) to meet the appropriate clean close standard.

(2) Swipe results converted by dividing the mass of the constituent by the mass of a 10 cm (length) x 10 cm (width) x 0.3175 cm (thick) section of roof.
Given the following: Swipe area = 10 cm x 10 cm; roof thickness = 0.3175 cm; density steel = 7.85 g/cc.
Steel (volume) = 10 cm x 10 cm x 0.3175 cm = 31.75 cc.
Steel (mass) = 31.75 cc x 7.85 gram/cc = 249.24 g = 0.24924 kg.
Constituent (mass) = 0.00036 mg.
Concentration = 0.00036 mg/0.24924 kg = 0.0014 mg/kg

Sample #CSU-233N-F-1 (north cell, floor sample location #1)
Sample Matrix - Soil, Concrete

Radioactivity Summary	Analyte	Sample Media			Release Level (RL)	Units	Comments
		concrete	soil 0'	soil 2'	concrete/soil		
	Gross alpha	1.3	1.4	2.5	<15	pCi/g	
	Gross beta	1.3	1.1	5.2	<25	pCi/g	
	Tritium	4	3.4	3.2	–		

Volatile Organic Compounds Summary	Analyte	Sample Media			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
	Acetone	80	<20	<20	(1)	(1)	ug/kg	
	Ethylbenzene	43	<5	<5	(1)	(1)	ug/kg	
	Oil and Grease	Not analyzed	11.7	37.1	(1)	(1)	mg/kg	
	Toluene	68	6.3	10	(1)	(1)	ug/kg	
	Xylene	370	<10	<10	(1)	(1)	ug/kg	

Metals Summary	Analyte	Sample Media (2)			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
	Antimony	3.5	<1.3	1.7	–	1.12	mg/kg	LOS>Clean up level, 0' sample. (3)
	Barium	1770	60.7	138	428	308.00	mg/kg	(3)
	Cobalt	5.6	33.6	13.1	12.5	14.60	mg/kg	
	Selenium	19.3	2.7	5	–	0.40	mg/kg	
	Zinc	218	31.4	46	153	75.30	mg/kg	(3)
	Thallium	<2.1	<2.1	<2.1	–	0.5	mg/kg	LOS>Soil clean up level.

Asbestos, pH Summary	Analyte	Sample Media			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
	Asbestos	Not analyzed	<1	<1	(1)	(1)	Percent	Soil samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.
	pH	Not analyzed	9.9	8	(1)	(1)	Units	

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

(3) High concrete metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233N-F-2 (north cell, floor sample location #2)

Sample Matrix - Soil, Concrete

	Analyte	Sample Media			Release Level (RL)	Units	Comments
Radioactivity Summary		concrete	soil 0'	soil 2'	concrete/soil		
	Gross alpha	1.4	0.71	1.9	<15	pCi/g	
	Gross beta	1.6	0.65	2.8	<25	pCi/g	
	Tritium	3.8	3.2	3.4	–		

	Analyte	Sample Media			Clean Up Level		Units	Comments
Volatile Organic Compounds Summary		concrete	soil 0'	soil 2'	concrete	soil		
	Acetone	66	<20	<20	(1)	(1)	ug/kg	
	Ethylbenzene	23	<5	<5	(1)	(1)	ug/kg	
	Heptachlor	2.3	<2	<2	(1)	(1)	ug/kg	
	Oil and Grease	Not analyzed	59.1	21.3	(1)	(1)	mg/kg	
	Toluene	110	11	<5	(1)	(1)	ug/kg	
	Trichlorofluoro-methane	<5	<5	8.5	(1)	(1)	ug/kg	
	Xylene	205	<5	<10	(1)	(1)	ug/kg	

	Analyte	Sample Media (2)			Clean Up Level		Units	Comments
Metals Summary		concrete	soil 0'	soil 2'	concrete	soil		
	Antimony	3.1	<1.3	<1.3	–	1.12	mg/kg	LOS soil>Clean up level.
	Barium	1320	83.4	148	428.00	308.00	mg/kg	(3)
	Cobalt	7.8	28.5	11.3	12.50	14.60	mg/kg	
	Lead	203	0.87	1.1	31.60	43.70	mg/kg	(3)
	Selenium	17.4	5.4	6.2	–	0.40	mg/kg	
	Silver	0.15	0.15	51	1.3	2.5	mg/kg	
	Zinc	184	32.7	44.4	153.00	75.00	mg/kg	(3)

	Analyte	Sample Media			Clean Up Level		Units	Comments
Asbestos, pH Summary		concrete	soil 0'	soil 2'	concrete	soil		
	Asbestos	Not analyzed	<1	<1	(1)	(1)	Percent	Soil samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.
	pH	Not analyzed	10.3	8.3	(1)	(1)	Units	

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

(3) High concrete metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233N-F-3 (north cell, floor sample location #3)

Sample Matrix - Soil, Concrete

	Analyte	Sample Media			Release Level (RL)	Units	Comments
		concrete	soil 0'	soil 2'	concrete/soil		
Radioactivity Summary	Gross alpha	1.5	0.85	1	<15	pCi/g	
	Gross beta	1.7	0.75	1.6	<25	pCi/g	
	Tritium	4	3.4	3.2	–		

	Analyte	Sample Media			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
Volatile Organic Compounds Summary	Acetone	70	<20	<20	(1)	(1)	ug/kg	
	Di-n-butylphthalate	610	<330	<330	(1)	(1)	ug/kg	
	Ethylbenzene	370	<5	<5	(1)	(1)	ug/kg	
	Heptachlor	2.4	<2	<2	(1)	(1)	ug/kg	
	Oil and Grease	<10	<10	23.4	(1)	(1)	mg/kg	
	Toluene	160	18	44	(1)	(1)	ug/kg	
	Xylene	2600	<10	<10	(1)	(1)	ug/kg	

	Analyte	Sample Media (2)			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
Metals Summary	Antimony	3.5	1.7 (2)	<1.3	–	1.12	mg/kg	LOS soil 2'>Clean up level.
	Thallium	<2.1	<2.1	2.8	–	0.50	mg/kg	LOS soil 0'>Clean up level.
	Barium	3710	86.4	127	428.00	308.00	mg/kg	(3)
	Zinc	1040	38.7	38.3	153.00	75.30	mg/kg	(3)
	Cobalt	13.3	38.1	20.4	12.50	14.60	mg/kg	
	Selenium	17.5	5.3	5.4	–	0.40	mg/kg	
	Strontium	185	19.7	24.8	169	(1)	mg/kg	(3)
	Silver	<0.15	2.9	1.6	1.3	2.5	mg/kg	

	Analyte	Sample Media			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
Asbestos, pH Summary	Asbestos	Not analyzed	<1	<1	(1)	(1)	Percent	Soil samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.
	pH	Not analyzed	10	8.5	(1)	(1)	Units	

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

(3) High concrete metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233N-W-1 (north cell, wall sample location #1)

Sample Matrix - Cinder block

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Cinder block			
	Gross alpha	1.8	<15	pCi/g	
	Gross beta	2.1	<25	pCi/g	
	Tritium	4.2	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Cinder block			
	2-Hexanone	25	(1)	ug/kg	
	4-Methyl-2-pentanone	140	(1)	ug/kg	
	Acetone	220	(1)	ug/kg	
	BHC, beta isomer	2.6	(1)	ug/kg	
	BHC, delta isomer	2.7	(1)	ug/kg	
	cis-Chlordane	7.8	(1)	ug/kg	
	Heptachlor	8.7	(1)	ug/kg	
	Methyl ethyl ketone	43	(1)	ug/kg	
	p,p-DDE	4.8	(1)	ug/kg	
	p,p-DDT	6	(1)	ug/kg	
	trans-Chlordane	6.2	(1)	ug/kg	
	Toluene	48	(1)	ug/kg	
	Xylene	8.9	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Cinder block			
	Antimony	24.4	(1)	mg/kg	
	Barium	4400	(1)	mg/kg	(2)
	Cadmium	0.96	(1)	mg/kg	
	Chromium	63.7	(1)	mg/kg	
	Cobalt	3.5	(1)	mg/kg	
	Copper	14.5	(1)	mg/kg	
	Lead	4010	(1)	mg/kg	(2)
	Manganese	213	(1)	mg/kg	
	Mercury	1.7	(1)	mg/kg	
	Molybdenum	4.4	(1)	mg/kg	
	Nickel	10.8	(1)	mg/kg	
	Potassium	612	(1)	mg/kg	
	Selenium	15.1	(1)	mg/kg	
	Strontium	204	(1)	mg/kg	
	Vanadium	9.7	(1)	mg/kg	
	Zinc	3570	(1)	mg/kg	(2)

All metals over the detection limit reported.

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) High metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233N-W-2 (north cell, wall sample location #2)

Sample Matrix - Cinder block wall

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Cinder block			
	Gross alpha	1.5	<15	pCi/g	
	Gross beta	1.7	<25	pCi/g	
	Tritium	4	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Cinder block			
	2-Hexanone	30	(1)	ug/kg	
	4-Methyl-2-pentanone	400	(1)	ug/kg	
	Acetone	150	(1)	ug/kg	
	BHC, beta isomer	2.8	(1)	ug/kg	
	cis-Chlordane	4	(1)	ug/kg	
	Endrin	1.3	(1)	ug/kg	
	Heptachlor	2.9	(1)	ug/kg	
	Heptachlor epoxide	2.6	(1)	ug/kg	
	Methyl ethyl ketone	36	(1)	ug/kg	
	p,p-DDT	6.5	(1)	ug/kg	
	Toluene	75	(1)	ug/kg	
	trans-Chlordane	3.3	(1)	ug/kg	
	Xylene	52	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Cinder block			
	Antimony	15.5	(1)	mg/kg	
	Arsenic	1.5	(1)	mg/kg	
	Barium	3250	(1)	mg/kg	(2)
	Cadmium	0.33	(1)	mg/kg	
	Chromium	29.9	(1)	mg/kg	
	Cobalt	4.7	(1)	mg/kg	
	Copper	13.1	(1)	mg/kg	
	Lead	2010	(1)	mg/kg	(2)
	Manganese	195	(1)	mg/kg	
	Mercury	3	(1)	mg/kg	
	Molybdenum	1.2	(1)	mg/kg	
	Nickel	9.4	(1)	mg/kg	
	Potassium	807	(1)	mg/kg	
	Selenium	12.3	(1)	mg/kg	
	Strontium	144	(1)	mg/kg	
	Vanadium	9.8	(1)	mg/kg	
	Zinc	778	(1)	mg/kg	(2)

All metals over the detection limit reported.

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) High metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233N-W-3 (north cell, wall sample location #3)

Sample Matrix - Cinder block

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Cinder block			
	Gross alpha	1.7	<15	pCi/g	
	Gross beta	2.1	<25	pCi/g	
	Tritium	4.1	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Cinder block			
	4-Methyl-2-pentanone	45	(1)	ug/kg	
	BHC, beta isomer	2.2	(1)	ug/kg	
	Heptachlor	2.2	(1)	ug/kg	
	Toluene	48	(1)	ug/kg	
	Xylene	7.9	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Cinder block			
	Antimony	9.1	(1)	mg/kg	
	Arsenic	2	(1)	mg/kg	
	Barium	2820	(1)	mg/kg	(2)
	Cadmium	0.15	(1)	mg/kg	
	Chromium	31.3	(1)	mg/kg	
	Cobalt	4.3	(1)	mg/kg	
	Copper	17.8	(1)	mg/kg	
	Lead	2230	(1)	mg/kg	(2)
	Manganese	253	(1)	mg/kg	
	Mercury	21.7	(1)	mg/kg	
	Molybdenum	1.3	(1)	mg/kg	
	Nickel	9.9	(1)	mg/kg	
	Potassium	916	(1)	mg/kg	
	Strontium	142	(1)	mg/kg	
	Vanadium	12.8	(1)	mg/kg	
	Zinc	658	(1)	mg/kg	(2)

All metals over the detection limit reported.

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) High metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233N-WF-1 (north cell, wood fence sample location #1)

Sample Matrix - Wood

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Wood			
	Gross alpha	0.9	<15	pCi/g	
	Gross beta	2.1	<25	pCi/g	
	Tritium	14	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Wood			
	Bis(2-ethylhexyl)phthalate	9100	(1)	ug/kg	
	Dimethylphthalate	370	(1)	ug/kg	
	Heptachlor	2.8	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Wood			
	Barium	13.8	(1)	mg/kg	
	Chromium	1.1	(1)	mg/kg	
	Cobalt	7.7	(1)	mg/kg	
	Copper	1.9	(1)	mg/kg	
	Lead	49.5	(1)	mg/kg	
	Manganese	57.4	(1)	mg/kg	
	Mercury	0.1	(1)	mg/kg	
	Nickel	0.63	(1)	mg/kg	
	Potassium	70.4	(1)	mg/kg	
	Selenium	0.84	(1)	mg/kg	
	Strontium	4.6	(1)	mg/kg	
	Zinc	109	(1)	mg/kg	

All metals over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Asbestos Summary		Wood			
	Asbestos	<1	(1)	Percent	Wood samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.

(1) See Attachment 10.

Sample #CSU-233N-WF-2 (north cell, wood fence sample location #2)

Sample Matrix - Wood

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Wood			
	Gross alpha	0.79	<15	pCi/g	
	Gross beta	2	<25	pCi/g	
	Tritium	13	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Wood			
	Dimethylphthalate	580	(1)	ug/kg	
	Bis(2-ethylhexyl)phthalate	1900	(1)	ug/kg	
	Toluene	1400	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Wood			
	Barium	30.5	(1)	mg/kg	
	Cadmium	0.054	(1)	mg/kg	
	Chromium	0.98	(1)	mg/kg	
	Cobalt	6.1	(1)	mg/kg	
	Copper	1.8	(1)	mg/kg	
	Lead	23.7	(1)	mg/kg	
	Manganese	43.3	(1)	mg/kg	
	Mercury	0.046	(1)	mg/kg	
	Molybdenum	0.18	(1)	mg/kg	
	Nickel	0.85	(1)	mg/kg	
	Potassium	127	(1)	mg/kg	
	Selenium	0.82	(1)	mg/kg	
	Strontium	4.8	(1)	mg/kg	
	Zinc	621	(1)	mg/kg	

All metals over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Asbestos Summary		Wood			
	Asbestos	<1	(1)	Percent	Wood samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.

(1) See Attachment 10.

Sample #CSU-233N-WF-3 (north cell, wood fence sample location #3)

Sample Matrix - Wood

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Wood			
	Gross alpha	1.1	<15	pCi/g	
	Gross beta	2.5	<25	pCi/g	
	Tritium	15	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Wood			
	Bis(2-ethylhexyl)phthalate	2100	(1)	ug/kg	
	Dimethylphthalate	450	(1)	ug/kg	
	Endosulfan sulfate	5.4	(1)	ug/kg	
	Heptachlor	2.7	(1)	ug/kg	
	Toluene	1200	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Wood			
	Antimony	1.5	(1)	mg/kg	
	Barium	27.4	(1)	mg/kg	
	Cadmium	0.048	(1)	mg/kg	
	Chromium	0.9	(1)	mg/kg	
	Cobalt	5.8	(1)	mg/kg	
	Copper	1.7	(1)	mg/kg	
	Lead	37	(1)	mg/kg	
	Manganese	44.6	(1)	mg/kg	
	Mercury	0.079	(1)	mg/kg	
	Molybdenum	0.25	(1)	mg/kg	
	Nickel	0.81	(1)	mg/kg	
	Potassium	136	(1)	mg/kg	
	Strontium	9.8	(1)	mg/kg	
	Vanadium	0.38	(1)	mg/kg	
	Zinc	574	(1)	mg/kg	

All metals over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Asbestos Summary		Wood			
	Asbestos	<1	(1)	Percent	Wood samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.

(1) See Attachment 10.

Sample #CSU-233S-C-1 (south cell, ceiling swipe location #1)

Sample Type - Swipe

Radioactivity Summary	Analyte	Sample Type	LOS	Units	Comments
		Swipe			
	Gross alpha	2.8	2.8	dpm	
	Gross beta	3.5	3.5	dpm	
	Tritium	22	22.0	dpm	

Volatile Organic Compounds Summary	Analyte	Sample Type	Clean Up Level	Concentration	Comments
		Swipe		(ng/kg)	
		(ng/swipe)			
	BHC, alpha isomer	5.1	(1)	20.4622	(2)

All VOCs over the detection limit reported.

Metals Summary	Analyte	Sample Type	Clean Up Level	Concentration	Comments
		Swipe		(mg/kg)	
		(mg/swipe)			
	Barium	0.00036	(1)	0.0014	(2)
	Cadmium	0.00012	(1)	0.0005	(2)
	Chromium	0.00055	(1)	0.0022	(2)
	Potassium	0.01900	(1)	0.0762	(2)
	Silver	0.00032	(1)	0.0013	(2)
	Strontium	0.00057	(1)	0.0023	(2)
	Vanadium	0.00130	(1)	0.0052	(2)
	Zinc	0.01100	(1)	0.0441	(2)

All metals over the detection limit reported.

(1) All residue resulting from the handling of hazardous waste in the facility will be removed and/or decomtaminated (if possible) to meet the appropriate clean close standard.

(2) Swipe results converted by dividing the mass of the constituent by the mass of a 10 cm (length) x 10 cm (width) x 0.3175 cm (thick) section of roof.
Given the following: Swipe area = 10 cm x 10 cm; roof thickness = 0.3175 cm; density steel = 7.85 g/cc.
Steel (volume) = 10 cm x 10 cm x 0.3175 cm = 31.75 cc.
Steel (mass) = 31.75 cc x 7.85 gram/cc = 249.24 g = 0.24924 kg.
Constituent (mass) = 0.00036 mg.
Concentration = 0.00036 mg/0.24924 kg = 0.0014 mg/kg

Sample #CSU-233S-F-1 (south cell, floor sample location #1)

Sample Matrix - Soil, Concrete

Radioactivity Summary

Analyte	Sample Media			Release Level (RL)	Units	Comments
	concrete	soil 0'	soil 2'	concrete/soil		
Gross alpha	1.7	2.8	2.1	<15	pCi/g	
Gross beta	2	2.9	3.1	<25	pCi/g	
Tritium	3.7	3.3	3.3	–		

Volatile Organic Compounds Summary

Analyte	Sample Media			Clean Up Level		Units	Comments
	concrete	soil 0'	soil 2'	concrete	soil		
4-Methyl-2-pentanone	33	ND	ND	(1)	(1)	ug/kg	
Acetone	39	ND	ND	(1)	(1)	ug/kg	
Di-n-butylphthalate	2100	ND	ND	(1)	(1)	ug/kg	
Ethylbenzene	15	ND	ND	(1)	(1)	ug/kg	
Oil and Grease	Not analyzed	18.6	ND	(1)	(1)	mg/kg	
Toulene	63	15	10	(1)	(1)	ug/kg	
Xylene	166	ND	ND	(1)	(1)	ug/kg	

Metals Summary

Analyte	Sample Media (2)			Clean Up Level		Units	Comments
	concrete	soil 0'	soil 2'	concrete	soil		
Manganese	142	376	395	567	(1)	mg/kg	
Potassium	472	1890	1950	2160	(1)	mg/kg	
Selenium	14	4.2	7	–	0.40	mg/kg	
Strontium	76.2	27.8	38.2	169	(1)	mg/kg	

Asbestos, pH Summary

Analyte	Sample Media			Clean Up Level		Units	Comments
	concrete	soil 0'	soil 2'	concrete	soil		
Asbestos	Not analyzed	<1	<1	(1)	(1)	Percent	Soil samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.
pH	Not analyzed	7.3	7.5	(1)	(1)	Units	

(1) All residue resulting from the handling of hazardous waste in the facility will be removed and/or decomtaminated (if possible) to meet the appropriate clean close standard.

(2) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

Sample #CSU-233S-F-2 (south cell, floor sample location #2)

Sample Matrix - Soil, Concrete

	Analyte	Sample Media			Release Level (RL)	Units	Comments
Radioactivity Summary		concrete	soil 0'	soil 2'	concrete/soil		
	Gross alpha	2.1	1.3	2.4	<15	pCi/g	
	Gross beta	2.3	1.3	2.3	<25	pCi/g	
	Tritium	4.1	3.3	3.2	–		

	Analyte	Sample Media			Clean Up Level		Units	Comments
Volatile Organic Compounds Summary		concrete	soil 0'	soil 2'	concrete	soil		
	4-Methyl-2-pentanone	27	ND	ND	(1)	(1)	ug/kg	
	cis-Chlordane	ND	2.2	ND	(1)	(1)	ug/kg	
	Di-n-butylphthalate	2200	ND	ND	(1)	(1)	ug/kg	
	Ethylbenzene	58	ND	ND	(1)	(1)	ug/kg	
	Oil and Grease	Not analyzed	92.1	10.3	(1)	(1)	mg/kg	
	Xylene	440	ND	ND	(1)	(1)	ug/kg	
	Toluene	72	7.2	ND	(1)	(1)	ug/kg	

	Analyte	Sample Media (2)			Clean Up Level		Units	Comments
Metals Summary		concrete	soil 0'	soil 2'	concrete	soil		
	Antimony	1.3	1.5	1.8	–	1.12	mg/kg	
	Manganese	232	386	399	567	(1)	mg/kg	
	Potassium	690	1300	2030	2160	(1)	mg/kg	
	Selenium	17.7	5.3	6.5	–	0.40	mg/kg	
	Strontium	97.6	27.2	39	169	(1)	mg/kg	

	Analyte	Sample Media			Clean Up Level		Units	Comments
Asbestos, pH Summary		concrete	soil 0'	soil 2'	concrete	soil		
	Asbestos	Not analyzed	<1	<1	(1)	(1)	Percent	Soil samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.
	pH	Not analyzed	9.1	7.4	(1)	(1)	Units	

(1) All residue resulting from the handling of hazardous waste in the facility will be removed and/or decomtaminated (if possible) to meet the appropriate clean close standard.

(2) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

Sample #CSU-233S-F-3 (south cell, floor sample location #3)

Sample Matrix - Soil, Concrete

Radioactivity Summary	Analyte	Sample Media			Release Level (RL)	Units	Comments
		concrete	soil 0'	soil 2'	concrete/soil		
	Gross alpha	1.6	1.3	1.8	<15	pCi/g	
	Gross beta	1.7	1.6	2	<25	pCi/g	
	Tritium	4	3.3	3.4	–		

Volatile Organic Compounds Summary	Analyte	Sample Media			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
	Acetone	42	ND	ND	(1)	(1)	ug/kg	
	Di-n-butylphthalate	1900	ND	ND	(1)	(1)	ug/kg	
	Ethylbenzene	350	ND	ND	(1)	(1)	ug/kg	
	Heptachlor	2.5	ND	ND	(1)	(1)	ug/kg	
	Xylene	2490	ND	ND	(1)	(1)	ug/kg	
	Toluene	100	5.9	ND	(1)	(1)	ug/kg	
	Oil and Grease	ND	78.3	ND	(1)	(1)	mg/kg	

Metals Summary	Analyte	Sample Media (2)			Clean Up Level		Units	Comments
		concrete	soil 0'	soil 2'	concrete	soil		
	Antimony	2.5	1.4	ND	–	1.12	mg/kg	
	Barium	518	114	ND	428	308.00	mg/kg	(3)
	Manganese	282	412	ND	567	(1)	mg/kg	
	Mercury	0.023	0.21	ND	0.30	0.14	mg/kg	
	Potassium	789	1820	ND	2160	(1)	mg/kg	
	Selenium	17.8	5.2	ND	–	0.40	mg/kg	
	Strontium	119	34.2	ND	169	(1)	mg/kg	

(1) All residue resulting from the handling of hazardous waste in the facility will be removed and/or decomtaminated (if possible) to meet the appropriate clean close standard.

(2) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

(3) High concrete metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233S-W-1 (south cell, wall sample location #1)

Sample Matrix - Cinder block

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Cinder block			
	Gross alpha	1.7	<15	pCi/g	
	Gross beta	2.8	<25	pCi/g	
	Tritium	4.1	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Cinder block			
	4-Methyl-2-pentanone	100	(1)	ug/kg	
	BHC, alpha isomer	2.8	(1)	ug/kg	
	BHC, beta isomer	16	(1)	ug/kg	
	cis-Chlordane	20	(1)	ug/kg	
	Dieldrin	41	(1)	ug/kg	
	Endosulfan II	7.3	(1)	ug/kg	
	Endrin	6.7	(1)	ug/kg	
	Ethylbenzene	5.4	(1)	ug/kg	
	Heptachlor	3.9	(1)	ug/kg	
	Heptachlor epoxide	2.4	(1)	ug/kg	
	p,p-DDD	6.4	(1)	ug/kg	
	p,p-DDE	15	(1)	ug/kg	
	p,p-DDT	20	(1)	ug/kg	
	Toluene	8	(1)	ug/kg	
	trans-Chlordane	4.2	(1)	ug/kg	
	Xylene	51	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Cinder block			
	Antimony	33.6	(1)	mg/kg	
	Arsenic	ND	(1)	mg/kg	
	Barium	3680	(1)	mg/kg	(2)
	Beryllium	ND	(1)	mg/kg	
	Cadmium	1.6	(1)	mg/kg	
	Chromium	109	(1)	mg/kg	
	Cobalt	31.1	(1)	mg/kg	
	Copper	10.7	(1)	mg/kg	
	Lead	5510	(1)	mg/kg	(2)
	Manganese	226	(1)	mg/kg	
	Mercury	3.8	(1)	mg/kg	
	Molybdenum	5.8	(1)	mg/kg	
	Nickel	28.3	(1)	mg/kg	
	Potassium	632	(1)	mg/kg	
	Selenium	13.3	(1)	mg/kg	
	Strontium	193	(1)	mg/kg	
	Vanadium	18.1	(1)	mg/kg	
	Zinc	4660	(1)	mg/kg	(2)

All metals over the detection limit reported.

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) High metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233S-W-2 (south cell, wall sample location #2)

Sample Matrix - Cinder block

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Cinder block			
	Gross alpha	1.3	<15	pCi/g	
	Gross beta	1.4	<25	pCi/g	
	Tritium	4.1	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Cinder block			
	2-Hexanone	24	(1)	ug/kg	
	4-Methyl-2-pentanone	52	(1)	ug/kg	
	Acetone	160	(1)	ug/kg	
	BHC, beta isomer	2.5	(1)	ug/kg	
	BHC, delta isomer	2.2	(1)	ug/kg	
	cis-Chlordane	4	(1)	ug/kg	
	Endrin	1.2	(1)	ug/kg	
	Heptachlor	6.2	(1)	ug/kg	
	Heptachlor epoxide	3.2	(1)	ug/kg	
	Methy ethyl ketone	36	(1)	ug/kg	
	p,p-DDT	5.2	(1)	ug/kg	
	Toluene	50	(1)	ug/kg	
	trans-Chlordane	5.5	(1)	ug/kg	
	Xylene	7.7	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Cinder block			
	Antimony	28.6	(1)	mg/kg	
	Barium	3300	(1)	mg/kg	(2)
	Cadmium	2.4	(1)	mg/kg	
	Chromium	83.3	(1)	mg/kg	
	Cobalt	4.3	(1)	mg/kg	
	Copper	12.1	(1)	mg/kg	
	Lead	4680	(1)	mg/kg	(2)
	Manganese	205	(1)	mg/kg	
	Mercury	4.8	(1)	mg/kg	
	Molybdenum	5.6	(1)	mg/kg	
	Nickel	13.9	(1)	mg/kg	
	Potassium	755	(1)	mg/kg	
	Selenium	14.6	(1)	mg/kg	
	Strontium	209	(1)	mg/kg	
	Vanadium	8	(1)	mg/kg	
	Zinc	4680	(1)	mg/kg	(2)

All metals over the detection limit reported.

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.

(2) High metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233S-W-3 (south cell, wall sample location #3)

Sample Matrix - Cinder block

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Cinder block			
	Gross alpha	1.5	<15	pCi/g	
	Gross beta	3.9	<25	pCi/g	
	Tritium	4.1	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Cinder block			
	2-Hexanone	38	(1)	ug/kg	
	4-Methyl-2-pentanone	62	(1)	ug/kg	
	Acetone	220	(1)	ug/kg	
	cis-Chlordane	3	(1)	ug/kg	
	Endrin	0.71	(1)	ug/kg	
	Heptachlor	2.2	(1)	ug/kg	
	Methyl ethyl ketone	56	(1)	ug/kg	
	Toluene	59	(1)	ug/kg	
	trans-Chlordane	2.1	(1)	ug/kg	
	Xylene	43	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Cinder block			
	Antimony	42.4	(1)	mg/kg	
	Barium	5180	(1)	mg/kg	(2)
	Cadmium	1.3	(1)	mg/kg	
	Chromium	87.2	(1)	mg/kg	
	Cobalt	4.1	(1)	mg/kg	
	Copper	10.9	(1)	mg/kg	
	Lead	6800	(1)	mg/kg	(2)
	Manganese	204	(1)	mg/kg	
	Mercury	2.3	(1)	mg/kg	
	Molybdenum	4.8	(1)	mg/kg	
	Nickel	11.8	(1)	mg/kg	
	Potassium	699	(1)	mg/kg	
	Selenium	12.1	(1)	mg/kg	
	Strontium	188	(1)	mg/kg	
	Vanadium	7.2	(1)	mg/kg	
	Zinc	3760	(1)	mg/kg	(2)

All metals over the detection limit reported.

(1) All residue resulting from hazardous waste operations in the facility will be evaluated to determine if decontamination and/or removal is necessary to meet the appropriate clean close standard.
(2) High metal concentrations may be due to paint/epoxy contamination.

Sample #CSU-233S-WF-1 (south cell, wood fence sample location #1)

Sample Matrix - Wood

Radioactivity Summary	Analyte	Sample Media	Release Level (RL)	Units	Comments
		Wood			
	Gross alpha	1	<15	pCi/g	
	Gross beta	1.8	<25	pCi/g	
	Tritium	17	–		

Volatile Organic Compounds Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Wood			
	Heptachlor	2.5	(1)	ug/kg	
	Toluene	1300	(1)	ug/kg	

All VOCs over the detection limit reported.

Metals Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Wood			
	Barium	51.5	(1)	mg/kg	
	Cadmium	0.08	(1)	mg/kg	
	Chromium	1.5	(1)	mg/kg	
	Cobalt	5.7	(1)	mg/kg	
	Copper	3.2	(1)	mg/kg	
	Lead	77	(1)	mg/kg	
	Manganese	63.5	(1)	mg/kg	
	Mercury	0.25	(1)	mg/kg	
	Molybdenum	0.32	(1)	mg/kg	
	Nickel	1.1	(1)	mg/kg	
	Potassium	101	(1)	mg/kg	
	Selenium	0.94	(1)	mg/kg	
	Strontium	10	(1)	mg/kg	
	Zinc	699	(1)	mg/kg	

All metals over the detection limit reported.

Asbestos Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Wood			
	Asbestos	<1	(1)	Percent	Wood samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.

(1) See Attachment 10.

Sample #CSU-233S-WF-2 (south cell, wood fence sample location #2)

Sample Matrix - Wood

	Analyte	Sample Media	Release Level (RL)	Units	Comments
Radioactivity Summary		Wood			
	Gross alpha	1.2	<15	pCi/g	
	Gross beta	3.2	<25	pCi/g	
	Tritium	17	–		

	Analyte	Sample Media	Clean Up Level	Units	Comments
Volatile Organic Compounds Summary		Wood			
	Bis(2-ethylhexyl)phthalate	2400	(1)	ug/kg	
	Butylbenzylphthalate	600	(1)	ug/kg	
	Heptachlor epoxide	2.3	(1)	ug/kg	
	o-Cresol	1100	(1)	ug/kg	
	Toluene	1300	(1)	ug/kg	

All VOCs over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Metals Summary		Wood			
	Barium	38.4	(1)	mg/kg	
	Cadmium	0.1	(1)	mg/kg	
	Chromium	1.1	(1)	mg/kg	
	Cobalt	7.9	(1)	mg/kg	
	Copper	2.6	(1)	mg/kg	
	Lead	29.2	(1)	mg/kg	
	Manganese	58.7	(1)	mg/kg	
	Mercury	0.042	(1)	mg/kg	
	Molybdenum	0.78	(1)	mg/kg	
	Nickel	0.98	(1)	mg/kg	
	Potassium	189	(1)	mg/kg	
	Strontium	6.4	(1)	mg/kg	
	Vanadium	0.26	(1)	mg/kg	
	Zinc	1030	(1)	mg/kg	

All metals over the detection limit reported.

	Analyte	Sample Media	Clean Up Level	Units	Comments
Asbestos Summary		Wood			
	Asbestos	<1	(1)	Percent	Wood samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.

(1) See Attachment 10.

Sample #CSU-233S-WF-3 (south cell, wood fence sample location #3)

Sample Matrix - Wood

Radioactivity Summary	Analyte	Sample Media	Release Level (RL)	Units	Comments
		Wood			
	Gross alpha	1.3	<15	pCi/g	
	Gross beta	3	<25	pCi/g	
	Tritium	15	–		

Volatile Organic Compounds Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Wood			
	Bis(2-ethylhexyl)phthalate	480	(1)	ug/kg	
	Heptachlor	2.2	(1)	ug/kg	

All VOCs over the detection limit reported.

Metals Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Wood			
	Barium	30.3	(1)	mg/kg	
	Cadmium	0.057	(1)	mg/kg	
	Chromium	1.1	(1)	mg/kg	
	Cobalt	5.9	(1)	mg/kg	
	Copper	1.9	(1)	mg/kg	
	Lead	20.6	(1)	mg/kg	
	Manganese	51.3	(1)	mg/kg	
	Mercury	0.046	(1)	mg/kg	
	Nickel	0.85	(1)	mg/kg	
	Potassium	156	(1)	mg/kg	
	Selenium	1.7	(1)	mg/kg	
	Strontium	5	(1)	mg/kg	
	Zinc	404	(1)	mg/kg	

All metals over the detection limit reported.

Asbestos Summary	Analyte	Sample Media	Clean Up Level	Units	Comments
		Wood			
	Asbestos	<1	(1)	Percent	Wood samples analyzed for the following minerals: actinolite/tremolite, amosite, anthophyllite, chrysotile, and crocidolite.

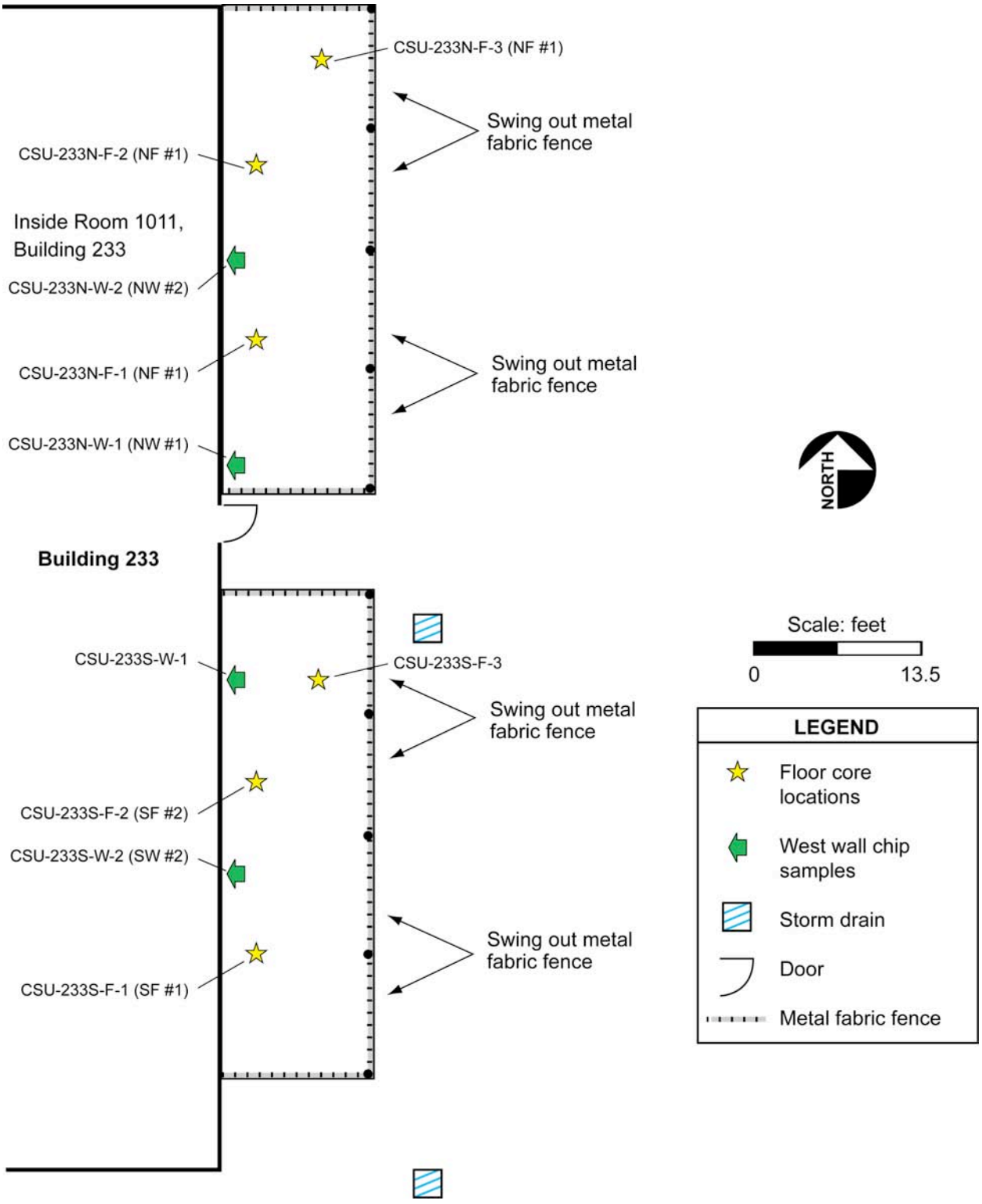
(1) See Attachment 10.

Attachment 5.

Phase II Analytical Summary

Contents

* See figure on next page for sample locations.



Phase II Sample Locations in B233 CSU

Sample #CSU-233-RINS
Sample Matrix - Rinsate

Volatile Organic Compounds Summary	Analyte		Sample Media	Units	Comments
			rinsate		
	Chloroform		13.	ug/L	
	pH		5.8	Units	

Metals Summary	Analyte	Sample Media	Units	Comments
		rinsate		
	Copper	0.16	mg/L	
	Potassium	1.23	mg/L	
	Zinc	0.343	mg/L	

Sample #CSU-233N-F-1
Sample Matrix - Soil, Concrete

	Analyte	Sample Media (1)							Clean Up Level	Clean Up Level	Units	Comments
		concrete	concrete-replicate	soil 5'	soil 5'-replicate	soil 10'	soil 15'	soil 20'	concrete	soil		
Metals Summary	Arsenic	3.17	3.79	5.06	5.58	4.46	3.56	4.28	6.8	8.51	mg/kg	
	Barium	132.	133.	231.	247.	180.	138.	149.	428	308	mg/kg	
	Chromium	29.2	33.2	37.5	42.2	32.2	25.5	77.2	59	72.4	mg/kg	
	Hexavalent Chromium	0.368	0.432						not listed in the closure plan	not listed in the closure plan	mg/kg	
	Hexavalent Chromium			2.27	6.5	10.7	4.69	< 2.09	not listed in the closure plan	not listed in the closure plan	ug/kg	
	Cobalt	5.31	5.74	12.1	12.8	10.1	8.8	7.27	12.5	14.6	mg/kg	
	Copper	14.3	16.	64.7	76.4	35.6	66.5	54.7	51.2	62.5	mg/kg	
	Lead	2.67	3.1	8.29	9.29	7.53	5.26	4.58	31.6	43.7	mg/kg	
	Manganese	362.	400.	506.	553.	437.	383.	568.	567	not listed in the closure plan	mg/kg	
	Mercury	< 0.1	< 0.1	< 0.11	< 0.11	< 0.11	0.266	< 0.105	0.30	0.14	mg/kg	
	Molybdenum	0.979	1.13	< 0.55	< 0.548	< 0.55	< 0.525	9.46	1.5	2.5	mg/kg	
	Nickel	38.5	42.3	50.8	57.8	40.9	36.1	39.9	61.5	82.8	mg/kg	
	Potassium	1,060.	1,190.	2,380.	2,630.	1,870.	1,710.	1,240.	2160	not listed in the closure plan	mg/kg	
	Strontium	143.	157.	52.7	56.8	49.3	30.9	29.8	169	not listed in the closure plan	mg/kg	
	Vanadium	29.7	33.3	33.7	37.6	34.3	26.5	21.7	56.4	65.2	mg/kg	
	Zinc	29.7	29.4	71.4	79.2	49.9	58.3	51.5	153	75.3	mg/kg	

(1) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

Sample #CSU-233N-F-2
Sample Matrix - Soil

	Analyte	Sample Media				Clean Up Levels	Units	Comments
		soil 5'	soil 10'	soil 15'	soil 20'	soil		
Metals Summary	Arsenic	4.86	4.29	3.51	4.67	8.51	mg/kg	
	Barium	224.	213.	169.	164.	308.	mg/kg	
	Chromium	41.6	37.1	26.	34.5	72.4	mg/kg	
	Cobalt	12.8	11.1	9.55	7.39	14.6	mg/kg	
	Copper	32.2	42.9	55.8	38.9	62.5	mg/kg	
	Lead	8.12	7.73	5.5	5.34	43.7	mg/kg	
	Manganese	498.	479.	410.	601.	not listed in the closure plan	mg/kg	
	Molybdenum	< 0.554	< 0.548	< 0.532	1.05	2.5	mg/kg	
	Nickel	48.	40.7	29.9	36.7	82.8	mg/kg	
	Potassium	2,720.	2,900.	2,040.	2,030.	not listed in the closure plan	mg/kg	
	Strontium	57.1	63.3	46.6	41.9	not listed in the closure plan	mg/kg	
	Vanadium	38.5	42.3	34.7	30.1	65.2	mg/kg	
	Zinc	62.	65.1	55.2	60.4	75.3	mg/kg	

Sample #CSU-233N-F-3
Sample Matrix - Soil, Concrete

	Analyte	Sample Media (1)					Clean Up Levels	Clean Up Levels	Units	Comments
		concrete	soil 5'	soil 10'	soil 15'	soil 20'	concrete	soil		
Metals Summary	Arsenic	3.43	4.15	4.71	4.02	3.2	6.8	8.51	mg/kg	
	Barium	132	204	205	133	124	428	308	mg/kg	
	Chromium	44.8	36.9	34.6	34.9	22.8	59	72.4	mg/kg	
	Hexavalent Chromium	0.325					not listed in the closure plan	not listed in the closure plan	mg/kg	
	Hexavalent Chromium		5.01	3.11	2.13	4.2	not listed in the closure plan	not listed in the closure plan	ug/kg	
	Cobalt	6.2	10.8	11.4	8.57	5.85	12.5	14.6	mg/kg	
	Copper	16.4	53.4	50.	117	22.5	51.2	62.5	mg/kg	
	Lead	3.13	7.44	8.39	5.4	4.58	31.6	43.7	mg/kg	
	Manganese	455	492	478	417	342	567	not listed in the closure plan	mg/kg	
	Molybdenum	0.975	< 0.542	< 0.56	0.553	< 0.528	1.5	2.5	mg/kg	
	Nickel	45.9	48.2	42.	37.9	31.2	61.5	82.8	mg/kg	
	Potassium	1200	2140	2270	1850	1290	2160	not listed in the closure plan	mg/kg	
	Strontium	133	43.5	62.3	29.8	24.3	169	not listed in the closure plan	mg/kg	
	Vanadium	32.7	30	39.8	24.3	22.6	56.4	65.2	mg/kg	
	Zinc	30.3	63.2	64.4	86.1	39	153	75.3	mg/kg	

(1) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

Sample #CSU-233N-W-1
Sampe Matrix - Cinder block

	Analyte	Sample Media	Units	Comments
		cinder block		
Metals Summary	Arsenic	5.91	mg/kg	
	Barium	118.	mg/kg	
	Chromium	8.64	mg/kg	
	Hexavalent Chromium	0.368	mg/kg	
	Cobalt	2.45	mg/kg	
	Copper	18.8	mg/kg	
	Lead	2.47	mg/kg	
	Manganese	257.	mg/kg	
	Mercury	0.243	mg/kg	
	Molybdenum	0.539	mg/kg	
	Nickel	7.59	mg/kg	
	Potassium	871.	mg/kg	
	Strontium	108.	mg/kg	
	Vanadium	15.1	mg/kg	
	Zinc	17.2	mg/kg	

Sample #CSU-233N-W-2
Sample Matrix - Cinder block

	Analyte	Sample Media	Units	Comments
		cinder block		
Metals Summary	Arsenic	6.18	mg/kg	
	Barium	108.	mg/kg	
	Chromium	9.46	mg/kg	
	Hexavalent Chromium	0.487	mg/kg	
	Cobalt	2.52	mg/kg	
	Copper	20.4	mg/kg	
	Lead	3.3	mg/kg	
	Manganese	290.	mg/kg	
	Mercury	0.243	mg/kg	
	Molybdenum	0.518	mg/kg	
	Nickel	8.32	mg/kg	
	Potassium	983.	mg/kg	
	Strontium	115.	mg/kg	
	Vanadium	17.3	mg/kg	
	Zinc	19.1	mg/kg	

Sample #CSU-233S-F-1
Sample Matrix - Soil

	Analyte	Sample Media (1)					Clean Up Level	Units	Comments
		soil 5'	soil-replicate 5'	soil 10'	soil 15'	soil 20'	soil		
Metals Summary	Arsenic	4.58	4.68	4.13	3.98	4.	8.51	mg/kg	
	Barium	214.	218.	150.	158.	176.	308	mg/kg	
	Chromium	38.4	40.9	33.9	33.8	26.7	72.4	mg/kg	
	Hexavalent Chromium	7.8	7.17	2.62	2.5	2.38	not listed in the closure plan	ug/kg	
	Cobalt	11.8	12.6	9.72	10.7	10.3	14.6	mg/kg	
	Copper	28.8	33.4	59	69.5	36.2	62.5	mg/kg	
	Lead	8.16	8.61	6.75	5	5.85	43.7	mg/kg	
	Manganese	500	508	421	492	459	not listed in the closure plan	mg/kg	
	Molybdenum	< 0.561	0.588	0.702	0.585	< 0.544	2.5	mg/kg	
	Nickel	52.	54.	46.6	47.8	38.5	82.8	mg/kg	
	Potassium	2240	2260	2020	1920	1890	not listed in the closure plan	mg/kg	
	Strontium	51.8	52.2	44.2	32.3	37.9	not listed in the closure plan	mg/kg	
	Vanadium	34.1	33.9	30.4	25.9	26.9	65.2	mg/kg	
	Zinc	57	59.5	58	68.6	47.9	75.3	mg/kg	

(1) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

Sample #CSU-233S-F-2
Sample Matrix - Soil

	Analyte	Sample Media				Clean Up Level	Units	Comments
		soil 5'	soil 10'	soil 15'	soil 20'	soil		
Metals Summary	Arsenic	4.75	4.15	4.45	4.15	8.51	mg/kg	
	Barium	213.	195.	127.	143.	308	mg/kg	
	Chromium	42.4	36.1	31.3	22.6	72.4	mg/kg	
	Cobalt	11.3	10.5	8.81	6.76	14.6	mg/kg	
	Copper	50.2	57.3	26.9	42.4	62.5	mg/kg	
	Lead	8.04	7.51	5.38	4.84	43.7	mg/kg	
	Manganese	504.	464.	385.	300.	not listed in the closure plan	mg/kg	
	Nickel	48.8	40.4	36.3	29.8	82.8	mg/kg	
	Potassium	2,920.	2,860.	1,910.	1,920.	not listed in the closure plan	mg/kg	
	Strontium	54.	59.7	42.6	36.7	not listed in the closure plan	mg/kg	
	Vanadium	38.9	39.9	29.	27.	65.2	mg/kg	
	Zinc	70.4	66.9	54.2	56.2	75.3	mg/kg	

Sample #CSU-233S-F-3
Sample Matrix - Soil

	Analyte	Sample Media (1)				Clean Up Level	Units	Comments
		soil 5'	soil 10'	soil 15'	soil 20'	soil		
Metals Summary	Arsenic	5.33	5.2	3.67	4.84	8.51	mg/kg	
	Barium	248.	219.	151.	166.	308	mg/kg	
	Chromium	46.4	37.8	24.5	31.3	72.4	mg/kg	
	Hexavalent Chromium	9.93	7.34	10.5	9.18	not listed in the closure plan	ug/kg	
	Cobalt	13.8	11.7	8.8	7.7	14.6	mg/kg	
	Copper	52.7	31.2	93.	49.7	62.5	mg/kg	
	Lead	8.84	8.24	5.18	5.7	43.7	mg/kg	
	Manganese	564.	498.	382.	545.	not listed in the closure plan	mg/kg	
	Molybdenum	< 0.551	0.702	< 0.562	0.73	2.5	mg/kg	
	Nickel	63.7	48.	32.4	43.	82.8	mg/kg	
	Potassium	2,760.	2,290.	1,830.	1,850.	not listed in the closure plan	mg/kg	
	Strontium	56.1	63.9	36.2	43.5	not listed in the closure plan	mg/kg	
	Vanadium	39.1	37.7	27.6	24.7	65.2	mg/kg	
	Zinc	84.3	55.1	70.4	59.3	75.3	mg/kg	

(1) Results in bold indicate a constituent concentration or LOS value greater than the clean up or release level.

Sample #CSU-233S-W-1
Sample Matrix - Cinder block

	Analyte	Sample Media	Units	Comments
		cinder block		
Metals Summary	Arsenic	7.98	mg/kg	
	Barium	176.	mg/kg	
	Chromium	13.8	mg/kg	
	Hexavalent Chromium	1.17	mg/kg	
	Cobalt	3.56	mg/kg	
	Copper	28.2	mg/kg	
	Lead	17.7	mg/kg	
	Manganese	362.	mg/kg	
	Mercury	0.448	mg/kg	
	Molybdenum	0.587	mg/kg	
	Nickel	10.4	mg/kg	
	Potassium	1,280.	mg/kg	
	Strontium	139.	mg/kg	
	Vanadium	45.	mg/kg	
	Zinc	39.1	mg/kg	

Sample #CSU-233S-W-2
Sample Matrix - Cinder block

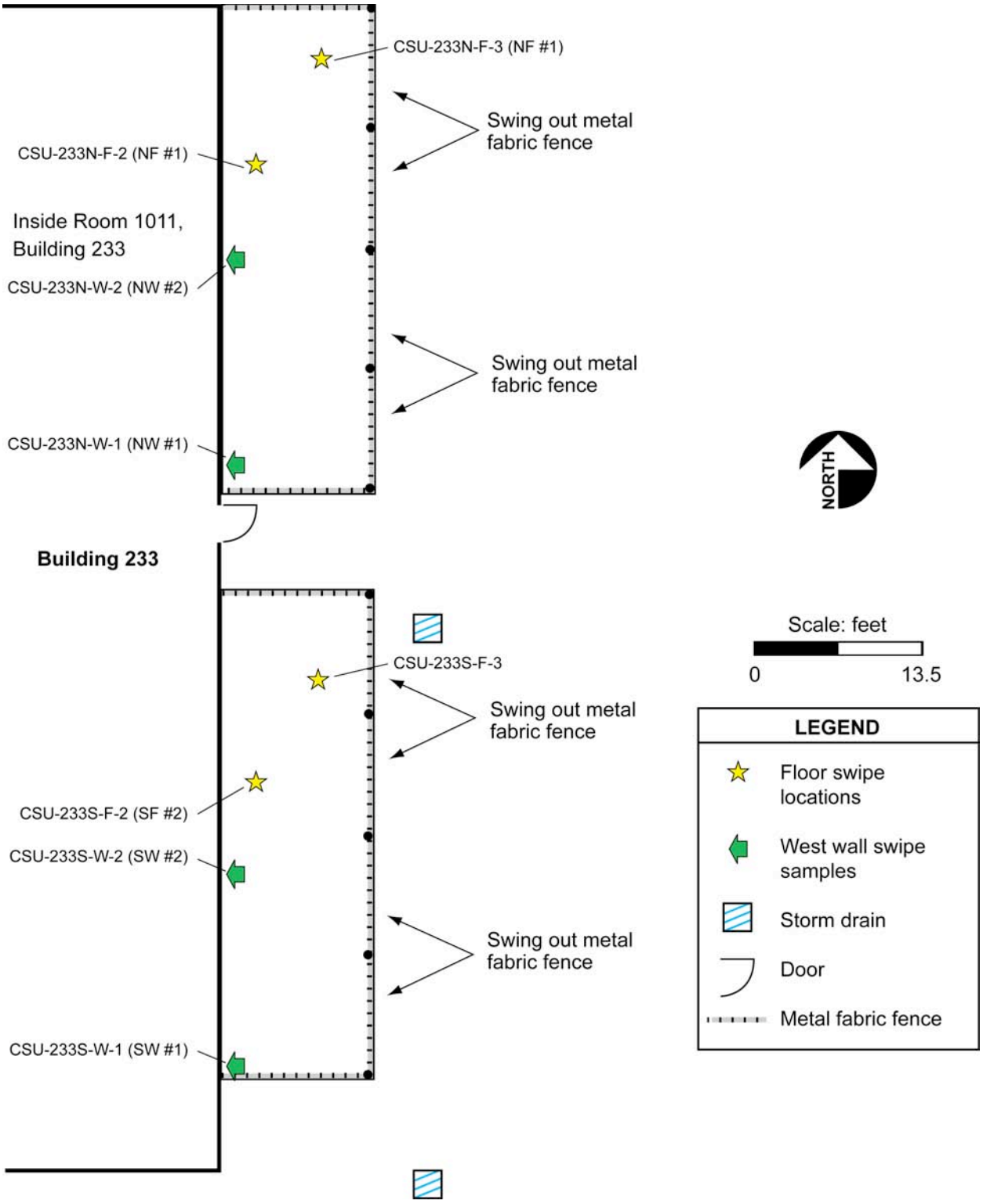
	Analyte	Sample Media	Units	Comments
		cinder block		
Metals Summary	Arsenic	6.	mg/kg	
	Barium	114.	mg/kg	
	Chromium	9.56	mg/kg	
	Hexavalent Chromium	0.325	mg/kg	
	Cobalt	2.69	mg/kg	
	Copper	20.6	mg/kg	
	Lead	3.36	mg/kg	
	Manganese	266.	mg/kg	
	Mercury	0.172	mg/kg	
	Nickel	8.8	mg/kg	
	Potassium	1,080.	mg/kg	
	Strontium	105.	mg/kg	
	Vanadium	16.4	mg/kg	
	Zinc	21.9	mg/kg	

Attachment 6.

Phase III Analytical Summary

Phase III Contents

* See figure on next page for sample locations.



Phase III Sample Locations in B233 CSU

Sample #CSU-233S-RINSATE
Sample Matrix - Rinsate

	Analyte	Sample Media	Units
		swipe	
	Aldrin	< 0.094	ug/L
	BHC, alpha isomer	0.095	ug/L
	BHC, beta isomer	0.7	ug/L
	BHC, gamma isomer (Lindane)	0.1	ug/L
P	Chlordane	< 0.19	ug/L
e	cis-Chlordane	< 0.094	ug/L
s	Dieldrin	< 0.19	ug/L
t	Endosulfan I	0.24	ug/L
i	Endosulfan II	< 0.19	ug/L
c	Endosulfan sulfate	< 0.19	ug/L
i	Endrin	< 0.19	ug/L
d	Endrin aldehyde	< 0.19	ug/L
e	Heptachlor	< 0.094	ug/L
s	Heptachlor epoxide	< 0.094	ug/L
	Methoxychlor	< 0.94	ug/L
	p,p-DDD	< 0.19	ug/L
	p,p-DDE	< 0.19	ug/L
	p,p-DDT	< 0.19	ug/L
	Toxaphene	< 1.9	ug/L
	trans-Chlordane	< 0.094	ug/L

Sample #CSU-233N-RINSATE
Sample Matrix - Rinsate

	Analyte	Sample Media	Units
		swipe	
Pesticides	Aldrin	< 0.19	ug/L
	BHC, alpha isomer	0.31	ug/L
	BHC, beta isomer	0.98	ug/L
	BHC, gamma isomer (Lindane)	< 0.19	ug/L
	Chlordane	< 0.38	ug/L
	cis-Chlordane	< 0.19	ug/L
	Dieldrin	< 0.38	ug/L
	Endosulfan I	< 0.19	ug/L
	Endosulfan II	< 0.38	ug/L
	Endosulfan sulfate	< 0.38	ug/L
	Endrin	< 0.38	ug/L
	Endrin aldehyde	< 0.38	ug/L
	Heptachlor	< 0.19	ug/L
	Heptachlor epoxide	< 0.19	ug/L
	Methoxychlor	< 1.9	ug/L
	p,p-DDD	0.49	ug/L
	p,p-DDE	< 0.38	ug/L
	p,p-DDT	< 0.38	ug/L
	Toxaphene	< 3.8	ug/L
	trans-Chlordane	< 0.19	ug/L

Sample #CSU-233S-W-2
Sample Matrix - Swipe

	Analyte	Sample Media		Units
		swipe		
Pesticides	Aldrin	<	0.1	ug/wipe
	BHC, alpha isomer	<	0.1	ug/wipe
	BHC, beta isomer	<	0.1	ug/wipe
	BHC, gamma isomer (Lindane)	<	0.1	ug/wipe
	Chlordane	<	0.2	ug/wipe
	cis-Chlordane	<	0.1	ug/wipe
	Dieldrin	<	0.2	ug/wipe
	Endosulfan I	<	0.1	ug/wipe
	Endosulfan II	<	0.2	ug/wipe
	Endosulfan sulfate	<	0.2	ug/wipe
	Endrin	<	0.2	ug/wipe
	Endrin aldehyde	<	0.2	ug/wipe
	Heptachlor	<	0.1	ug/wipe
	Heptachlor epoxide	<	0.1	ug/wipe
	Methoxychlor	<	1.	ug/wipe
	p,p-DDD	<	0.2	ug/wipe
	p,p-DDE	<	0.2	ug/wipe
	p,p-DDT	<	0.2	ug/wipe
	Toxaphene	<	2.	ug/wipe
	trans-Chlordane	<	0.1	ug/wipe

Sample #CSU-233S-F-1
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	
	Aldrin	< 0.1	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	< 0.1	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
P	Chlordane	< 0.2	ug/wipe
e	cis-Chlordane	< 0.1	ug/wipe
s	Dieldrin	< 0.2	ug/wipe
t	Endosulfan I	< 0.1	ug/wipe
i	Endosulfan II	< 0.2	ug/wipe
c	Endosulfan sulfate	< 0.2	ug/wipe
i	Endrin	< 0.2	ug/wipe
d	Endrin aldehyde	< 0.2	ug/wipe
e	Heptachlor	< 0.1	ug/wipe
s	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Sample #CSU-233N-F-2
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	
Pesticides	Aldrin	< 0.1	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	< 0.1	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
	Chlordane	< 0.2	ug/wipe
	cis-Chlordane	< 0.1	ug/wipe
	Dieldrin	< 0.2	ug/wipe
	Endosulfan I	< 0.1	ug/wipe
	Endosulfan II	< 0.2	ug/wipe
	Endosulfan sulfate	< 0.2	ug/wipe
	Endrin	< 0.2	ug/wipe
	Endrin aldehyde	< 0.2	ug/wipe
	Heptachlor	0.12	ug/wipe
	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Sample #CSU-233N-F-3
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	
	Aldrin	< 0.1	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	0.15	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
P	Chlordane	< 0.2	ug/wipe
e	cis-Chlordane	< 0.1	ug/wipe
s	Dieldrin	< 0.2	ug/wipe
t	Endosulfan I	< 0.1	ug/wipe
i	Endosulfan II	< 0.2	ug/wipe
c	Endosulfan sulfate	< 0.2	ug/wipe
i	Endrin	< 0.2	ug/wipe
d	Endrin aldehyde	< 0.2	ug/wipe
e	Heptachlor	< 0.1	ug/wipe
s	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Sample #CSU-233S-F-2
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	
	Aldrin	0.13	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	0.14	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
P	Chlordane	< 0.2	ug/wipe
e	cis-Chlordane	< 0.1	ug/wipe
s	Dieldrin	< 0.2	ug/wipe
t	Endosulfan I	< 0.1	ug/wipe
i	Endosulfan II	< 0.2	ug/wipe
c	Endosulfan sulfate	< 0.2	ug/wipe
i	Endrin	< 0.2	ug/wipe
d	Endrin aldehyde	< 0.2	ug/wipe
e	Heptachlor	< 0.1	ug/wipe
s	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Sample #CSU-233N-W-2
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	
	Aldrin	< 0.1	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	< 0.1	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
P	Chlordane	< 0.2	ug/wipe
e	cis-Chlordane	< 0.1	ug/wipe
s	Dieldrin	< 0.2	ug/wipe
t	Endosulfan I	< 0.1	ug/wipe
i	Endosulfan II	< 0.2	ug/wipe
c	Endosulfan sulfate	< 0.2	ug/wipe
i	Endrin	< 0.2	ug/wipe
d	Endrin aldehyde	< 0.2	ug/wipe
e	Heptachlor	< 0.1	ug/wipe
s	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Sample #CSU-233S-W-1
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	
	Aldrin	< 0.1	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	< 0.1	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
P	Chlordane	< 0.2	ug/wipe
e	cis-Chlordane	< 0.1	ug/wipe
s	Dieldrin	< 0.2	ug/wipe
t	Endosulfan I	< 0.1	ug/wipe
i	Endosulfan II	< 0.2	ug/wipe
c	Endosulfan sulfate	< 0.2	ug/wipe
i	Endrin	< 0.2	ug/wipe
d	Endrin aldehyde	< 0.2	ug/wipe
e	Heptachlor	< 0.1	ug/wipe
s	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Sample #CSU-233S-W-1-RP
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	ipe
	Aldrin	< 0.1	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	< 0.1	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
P	Chlordane	0.38	ug/wipe
e	cis-Chlordane	< 0.1	ug/wipe
s	Dieldrin	< 0.2	ug/wipe
t	Endosulfan I	< 0.1	ug/wipe
i	Endosulfan II	< 0.2	ug/wipe
c	Endosulfan sulfate	< 0.2	ug/wipe
i	Endrin	< 0.2	ug/wipe
d	Endrin aldehyde	< 0.2	ug/wipe
e	Heptachlor	0.14	ug/wipe
s	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Sample #CSU-233N-W-1
Sample Matrix - Swipe

	Analyte	Sample Media	Units
		swipe	
	Aldrin	< 0.1	ug/wipe
	BHC, alpha isomer	< 0.1	ug/wipe
	BHC, beta isomer	< 0.1	ug/wipe
	BHC, gamma isomer (Lindane)	< 0.1	ug/wipe
P	Chlordane	< 0.2	ug/wipe
e	cis-Chlordane	< 0.1	ug/wipe
s	Dieldrin	< 0.2	ug/wipe
t	Endosulfan I	< 0.1	ug/wipe
i	Endosulfan II	< 0.2	ug/wipe
c	Endosulfan sulfate	< 0.2	ug/wipe
i	Endrin	< 0.2	ug/wipe
d	Endrin aldehyde	< 0.2	ug/wipe
e	Heptachlor	< 0.1	ug/wipe
s	Heptachlor epoxide	< 0.1	ug/wipe
	Methoxychlor	< 1.	ug/wipe
	p,p-DDD	< 0.2	ug/wipe
	p,p-DDE	< 0.2	ug/wipe
	p,p-DDT	< 0.2	ug/wipe
	Toxaphene	< 2.	ug/wipe
	trans-Chlordane	< 0.1	ug/wipe

Attachment 7.

Development of LLNL-Specific Screening Values

Attachment 7. Development of LLNL-Specific Screening Values

Lawrence Livermore National Laboratory (LLNL) is a research and development institution for science and technology applied to national security. LLNL's Livermore site occupies an area of 1.3 square miles at the eastern boundary of the City of Livermore. LLNL has hundreds of permanent and temporary buildings, with various associated construction, maintenance and landscaping activities. Projects that generate excess soil include, but are not limited to

- fence post digging,
- utility project trenching,
- trailer installation.
- parking lot construction or modifying,
- new building construction,
- old building expansion,
- trailer demolition,
- landscaping, and
- storm drain regrading and maintenance.

As part of LLNL's aggressive waste minimization program, LLNL beneficially reuses excess soils as backfill, and in other projects at the Livermore Site. By attempting to balance soil use as much as possible on-site, LLNL minimizes the amount of excess soils disposed of at municipal landfills, reduces fuel consumption and reduces the amount of soils purchased as fill.

To properly implement its soil reuse program, LLNL developed Livermore-site-specific background values for constituents of concern (Folks, 1997). The background concentration distribution for each constituent was developed by fitting, when supported by sufficient data, a statistical distribution to the background data collected from soil sampling at Livermore Site. The distribution was developed for each metal separately. Developing statistically based background concentration levels was based on two key assumptions:

- The data used truly are from uncontaminated soils.
- The statistical model fits present and future data reasonably well.

The first assumption was met by screening the soil sampling data used in the data distribution. Samples associated with historical activities that resulted in known areas of contamination for any constituent (whether metal or organic) were eliminated. Samples from areas associated with other activities that also could contribute metal contamination, like parking lots, were also eliminated. The remaining data set represented uncontaminated soil.

The second assumption was met by using as much historical data as possible and mathematically transforming the data to achieve the best possible fit to the normal distribution.

A 99.5% upper prediction limit was selected to define background screening values. Given the above assumptions, about one out of every 200 samples from uncontaminated sites will exceed the statistically based screening value. Such samples will be incorrectly declared contaminated until a further evaluation is completed showing location of the sample is unlikely to be contaminated. The likelihood of correctly identifying samples from contaminated areas will depend on the degree of contamination, and therefore, cannot be determined in advance.

Soil samples with non-detectable levels of metals can either indicate the metal is not present in the sample (the concentration is zero), or the metal is actually present in the sample but at a concentration below the detection limit. There are two possible approaches to modeling this data to predict its upper limit: 1) fit a distribution to the detections only, or 2) take into account the percentage of non-detections when fitting the distribution. Case 1 is the appropriate model fitting the assumption that non-detections represent zero concentration. Case 2 is the appropriate model fitting the assumption that the metal is present but below the reporting level (i.e., contractual level below which the analytical laboratory is not required to provide a specific value for the sample, but only that the sample contains less than that level). Case 2 was followed in developing the LLNL statistically calculated background. Because metals are naturally present in soils, when the analytical lab reported the metal was not detected at a concentration above the analytical reporting limit, the nondetections (i.e., less than reporting limit values) are included when fitting the data to a distribution and calculating the 99.5 percentile.

Table A-1 presents the number of analyses, the number of detections, the maximum detection, and the screening value for surface soils (zero to 12 feet deep) calculated for total metals in Livermore Site soil.

Table A-1. Screening value support data.

Constituent	Number of samples	Number of detections	Transformation to normal distribution*	Approximate 50%ile of distribution*	Screening level†
Metals and metalloids					
Antimony	162	3			1.12
Arsenic	162	162	Boxcox (0.3)	2.7	8.51
Barium	162	162	Boxcox (0.7)	182	308
Beryllium	162	30		0.24	0.62
Cadmium	162	33			1.59
Chromium	242	242	Boxcox (0.8)	36	72.4
Chromium VI					Any detection
Cobalt	162	158	Boxcox (1.3)	9.5	14.6
Copper	162	160	Boxcox (0)	16	62.5
Lead	162	61	Boxcox (0)	7	43.7
Mercury	161	23	Boxcox (0)		0.14
Molybdenum	162	1			2.5
Nickel	162	162	Boxcox (0.4)	37	82.8
Selenium	162	0			0.4
Silver	162	1	Boxcox (0)	0.5	2.5
Thallium	162	2	Boxcox (0)		0.5
Vanadium	162	162	Boxcox (0.5)	34	65.2
Zinc	162	162	Boxcox (0)	40	75.3

* Blanks indicate small sample size or varying detection limits.

† Screening levels are the 99.5 confidence level of the measured values or the reporting limit

Attachment 8.
Concrete Floor Retest Results

Attachment 8. Concrete Floor Retest Results

Hazardous Constituents	CSU-233N-F-2 (Original Sample Results)	N-F-2 (Re-test results)	CSU-233S-F-3 (Original Sample Results)	S-F-3 Re-test
Antimony	3.1	ND	2.5	6.07
Arsenic	0.74	ND	1.1	ND
Barium	1320	173	518	123
Beryllium	0.42	ND	0.43	ND
Cadmium	0.048	ND	0.049	2.8
Chromium	26.9	47.8	26.6	41.7
Cobalt	7.8	7.95	7.3	8.86
Copper	10.3	19	9.8	14.7
Cyanide	1	Not tested	1	Not tested
Hex Chromium	0.4	Not tested	0.4	Not tested
Lead	203	5.09	0.71	3.74
Manganese	277	313	282	313
Mercury	0.027	0.031	0.023	0.025
Molybdenum	1.1	1.67	1	ND
Nickel	34.7	47.2	34.4	41.6
Potassium	754	1200	789	980
Selenium	17.4	17	17.8	20.2
Silver	0.15	ND	0.15	ND
Strontium	134	135	119	157
Thallium	2.1	ND	2.1	ND
Vanadium	25	31.6	23.3	29.6
Zinc	184	36	80.2	34.2

Attachment 9.

Cinder Block Wall Retest Results

Attachment 9 Cinder Block Wall Retest Results

Hazardous Constituents	S-W-3 (Original Sample Results)	S-W-3 (Re-test results)	N-W-3 (Original Sample Results)	N-W-3 (Re-test results)
Antimony	42.4	5.03	9.1	15.5
Arsenic	ND	ND	2	ND
Barium	5180	109	2820	125
Beryllium	ND	1.04	ND	ND
Cadmium	1.3	0.081	0.15	ND
Chromium	87.2	14.5	31.3	14.7
Cobalt	4.1	4.01	4.3	4.2
Copper	10.9	24.3	17.8	24.9
Lead	6800	5.11	2230	7.88
Manganese	204	239	253	319
Mercury	2.3	0.331	21.7	0.292
Molybdenum	4.8	ND	1.3	ND
Nickel	11.8	11.2	9.9	11.4
Potassium	699	940	916	1100
Selenium	12.1	18.3	ND	15.5
Silver	ND	ND	ND	ND
Strontium	188	101	142	109
Thallium	ND	ND	ND	ND
Vanadium	7.2	13.7	12.8	14.1
Zinc	3760	36.3	658	30.2

Attachment 10.

Memorandum from Industrial Hygienist

Interdepartmental letterhead

Mail Station L-344

Ext: 2-8794

Hazards Control Department
ES&H Team 3

October 1, 2007
HC-T3-07-056

To: Stanley Terusaki, L-627

From: Paul Borenstein

Subject: **B233 Wood Slats**

In reference to the question regarding the B233 wood slats remaining in place, based on my review of the metals and organic compounds screens, the residual amount of material found on the slats should not be of health concern. All of the metals were in the low parts per million by weight. In order for exposures to occur above the Threshold Limit Values, pounds of wood slats would have to be pulverized and the entire amount of particulate inhaled. The organic residues on the slats are still in the low part per million to low nanogram range in the wood and do not present a hazard to the workers for similar reasons. These materials also tend to have lower vapor pressures, which would minimize exposure from off-gassing. Regarding the ceiling, the metals concentrations on the swipe samples were significantly lower than the Laboratory release levels for the metals. The BHC -isomer is shown to be at the low nanogram concentration per 100cm2. This material is a variation of lindane that has an exposure limit of .5 mg/m3, therefore, it should also not pose a health risk.

Paul Borenstein
Deputy Team Leader
ES&H Team 3

Cc: Mohammad Abri, L-627
Paul Davis, L-344
Dave Prokosch, L-344
Warren TenBrook, L-344
B233 Building File: Environmental

Lawrence Livermore
National Laboratory